University of Sheffield

Automatic Control and Systems Engineering.

ACS6402/03 Industry Training Programme (ITP)

Handbook - Academic Year 2023/24

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Introduction

As part of your MSc degree it is important that you develop your technical knowledge and understanding, personal and professional skills and an appreciation of the wider context of your studies, including any industry-relevant perspective. Both the ITP and individual project in your degree are important in building on your taught modules and developing a greater level of independence in your learning and work. These projects are key in developing yourself personally and professionally as preparation for a future career in industry or research. The aim of the ITP project is to give you the opportunity to apply and further develop your existing knowledge and skills to solve a challenging engineering problem, while at the same time provide industry-relevant context for you to experience a 'real-life' project outside the comfort of the academic environment. A key part of this is working within a team, therefore developing your team working skills. You will be provided with overall guidance (academic and industrial) on the project. However, as MSc students you are expected to demonstrate a high level of initiative and independence as well as skills in creative and critical thinking, analysis, reflection, effective project management and communication. The project is very different from many of your taught modules where the lecturer takes the lead in your learning. In the project you are expected as a group to take the lead. You are also likely to work in technical areas and use skills that you have not covered previously in the MSc programme. Again, this is part of the project where you can demonstrate your initiative in developing such technical knowledge and skills as appropriate.

This handbook provides a summary of the project including the aims, timetable, assessment and description of deliverables. Copies of the actual assessment forms that will be used are also provided. It is strongly recommended that you read through this handbook carefully and refer to it throughout the duration of your project.

Professor George Panoutsos (Module Leader)

g.panoutsos@sheffield.ac.uk

Room B10, Amy Johnson Building

Dept. of Automatic Control and Systems Engineering

1. Module Learning Outcomes, Project Scenarios and Support

1.1 Learning Outcomes

This module has been designed to prepare students for professional practice, via a real industry-led group project in advanced manufacturing systems. The project's case-study will be a challenge provided by an industrial partner. The case study may be different each year, however it will be closely matched to modules and topics in the MSc curriculum. Example topics include: modelling and control in robotic systems, process monitoring in aerospace manufacturing processes, as well as model-based process optimisation using machine learning.

As part of this module, student groups will undertake computational and theoretical work, and present a report that will also require an in-depth literature review. To supplement the main technical challenge students will be supported directly by the module leader and teaching assistants in technical seminars on relevant topics. The industrial partner will also offer technical support as necessary. In preparation for professional practice, students should expect to engage with industry in the collaborator's preferred format (in terms of reports, presentations and progress meetings). This is to let students experience real industrial practice and processes.

The industry partner will define a number of projects and students are expected to work in groups. Students are expected to engage with the industry partner and attend a number of industrial seminars to familiarise themselves with the project and understand the technical challenges. Initially, students are required to develop a project plan with aims and objectives/deliverables and capture any necessary project requirements. Students should keep regular contact with academic mentors, as part of the scheduled interactions. This module is a 15-credit module, delivered over one academic semester (12 weeks) with direct involvement of an industrial partner. The assessments for this module include coursework only.

1.2 Intellectual Property

This module is exempt to the usual University rules as described in

http://calendar.dept.shef.ac.uk/calendar/08_regs_relating_to_Intellectual_Property.pdf

Intellectual property arrangements are also described in any agreement the University may have with the industry partner.

1.3 Project Work

Industry-relevant case studies will be defined by industry partners. For all project work you should assume you are working for a large organisation's research and development department. You have been tasked by the Director of Research and Development (whose role will be fulfilled by the academic module leader) to develop a demonstrator for a future concept that the company wants to explore. Throughout the project you should assume you are working as if you are in industry and manage your work and produce deliverables accordingly. The technical challenges in this project are designed to be representative of real research and development projects in industry.

Students will work alongside with professional Engineers and research staff to establish the direction on the project, this will include the identification of the requirements and envisaged approach to meet the project targets. Students will be supported as part of the ITP via technical and management sessions in manufacturing processes, systems engineering as well as technical topics relevant to each case study.

1.4 Budget

Each group will be provided with most of the equipment kit and software needed for the appropriate demonstrator, so it is not anticipated that a specific budget will be needed to be used to complete the projects. However, if students need to purchase small items of consumables, they will need to agree to this with the module leader.

1.5 Project Supervision and Support

Overall project supervision will be provided by university staff who will act as Directors of Research and Development. As far as it is feasible/realistic the projects will be run as industrial projects. However, clearly you can ask questions related to the academic aspects of the project as well. Your primary contact with the university staff will be through the scheduled project meetings. In these meetings, the project supervisor will not tell you what to do, but will act as an overall project owner and technical manager. You are expected to show initiative and independence in your work during the project. Attendance at these meetings will be monitored and it is expected that you act professionally and attend promptly. If you need to contact the academic staff outside of these meetings you should initially send an email to them.

It is expected that students will work largely autonomously, and this is a key element of the project. Students should demonstrate a high level of initiative and independence. However, specific technical support will also be available as appropriate.

The industrial partner will also offer direct technical support and expert process knowledge, this will be achieved via the scheduled interactions, as in the module's plan.

1.6 Project Meetings

You will have formal project management meetings with the Director of Research and Development (project supervisor) throughout the project as indicated on the module weekly plan. These meetings should be treated primarily as industrial meetings and not academic meetings (there will be opportunity to raise technical questions).

An effective approach to structuring meetings is around the three *Ps*: *Progress, Problems and Plans*. This provides a simple but effective structure for meetings and ensures that discussions are focused and key problems and actions are promptly identified. Each member of the group should briefly summarise their own progress, problems and plans.

2 Schedule of Project Deliverables and Assessments

Group Assessments:

	Mark (%)
You are required to submit an interim report, in Week 7 (by Monday 12 noon). This should include project management (aims, requirements, project plan), a literature review, and a technical plan with progress to date. [Learning Outcomes: LO3, LO4]	20
In Week 12, you will need to prepare and present a poster presentation to summarise your work. This should include your technical approach as well as main findings and recommendations. [Learning Outcomes: LO2, LO3]	20
A final project report will need to be submitted by Week 12 (21 May). This should effectively capture the work you've carried out throughout the whole semester, including literature review, technical approach and evidence of work where appropriate, findings and recommendations. [Learning Outcomes: LO1, LO2, LO3, LO4]	60

Peer assessment (more details in later section) will be used to adjust marks for the group-based assessments.

3 Schedule of Lectures/Seminars and Project Management Meetings

Week 1:

- Introduction to the module
- Module aims and objectives, teams, roles, expectations
- Systems engineering, requirements capture, Project management and planning

Week 2:

- Industrial interaction (background, overall aims, specific objectives)

Week 3:

- Technical Seminar

Week 4:

- QnA

Week 5:

- Technical Seminar

Week 6:

- Feedback on progress to date/separate group meetings

Weeks 7:

- Feedback on progress to date

Week 8:

- Project management meeting

Week 9:

- Project management meeting

Week 10:

- Industry interaction – via email

Week 11:

- Project management meeting

Week 12:

- Project delivery and Industrial interaction
- Presentation and final project report

4 General Advice on Work, Group Work and Laboratories

4.1 Workload

The project is worth 15 academic credits and therefore you are expected to spend approximately 150 hours each student in total working on the project during the academic year. As a guide you should be spending, on average, at least 12.5 hours working on the project per week, including any contact hours (for example for lectures, management meetings etc.). You should not underestimate the amount of time you need to spend on the project and you must ensure you manage your time effectively and efficiently, both individually and as a group.

It is also very important that you manage tasks across group members effectively. Each member of the group must do their fair share of the workload. You will have other assignments and coursework during the year and therefore you need to ensure you manage deadlines effectively. Note that these hours are a guide and in practice you may spend more time on the project at particular times during the project. In particular towards the end of the project you are likely to spend considerably more hours working on the project.

4.4 Groups

The groups will be allocated at random. Please note It is recommended that you appoint a group leader early on during the project (you may choose to rotate this role to give others an opportunity). It is important to realise that as a professional engineer you will work with people of different backgrounds, abilities, skills and disciplines. Good team working is about realising what each member of the group can bring to the project and exploiting everyone's particular knowledge and skills.

4.5 Group Meetings

It is expected that you should meet as a group at least once every week to discuss progress, the overall direction of the project against the plans and more detailed technical aspects of the project. In addition, you may meet in smaller subgroups about specific aspects of the project. You should conduct the meetings professionally and it is recommended that you appoint a chair for each meeting (which can vary throughout the project) and someone to take minutes (in particular of agreed actions and timescales).

It is recommended that you structure these meetings based on the three *Ps* as described in the previous section. This will help to ensure structure to the meetings and that they are as effective as possible.

4.6 Group Working

This is a group project and it is very important to ensure that you work as a group and that every member of the group engages fully and contributes equally to the group. Common problems within groups include:

- Group members taking too much control and dominating the group. This is poor team working, can lead to resentment, may result in the wrong work being done (if the dominant person is incorrect) and ultimately can lead to a breakdown in the group;

- Group members not contributing sufficiently and in a timely fashion to group activities and deliverables. This leads to other group members having to work extra to cover weaker group members and can disrupt their own carefully planned work schedule; and
- Group members not being sensitive to cultural and personal differences. It is the responsibility of all group members to contribute and to encourage others to contribute.

It is very important for you all to work effectively within your groups. This includes attending ALL group meetings promptly (and providing sufficient notice of unavoidable absences), planning your work realistically and effectively (including taking account of other coursework deadlines), communicating effectively, discussing issues as they arise, being honest and ensuring you put in your fair share of work. Group work can be difficult, but it is a very important skill you need to develop and is a key part of being a professional engineer. It is also important to deal with issues in a timely and professional manner. It is better to resolve group issues earlier rather than later.

4.7 Technical Areas

When researching and designing your solution you will need to consider a number of technical areas. Each of these must be researched, alternative options considered and discussed and conclusions drawn. It is important that you conduct necessary calculations, simulations and experimental work to justify the decisions taken in each area and to demonstrate your knowledge of these areas. Your ability to critically appraise different solutions is a key skill you need to demonstrate.

You will need to think carefully about exactly what technical areas you cover in the project and how these are allocated to group members. In the final report you will each need to write a substantial individual chapter, so it is essential you have a substantial individual technical area to write about that fits coherently into the final report. Think about the strengths of group members when deciding on the allocation of technical work.

4.9 Health and Safety

You are not expected in this project to work directly on any hardware. However, if this is the case, it is essential that you follow all relevant health and safety guidance. Failure to do so will result in serious disciplinary action that could result in expulsion from the university and legal prosecution. As a minimum you should expect to receive zero marks for the project if the group breaches these rules.

All mains powered equipment must be PAT tested by the department prior to first use. If you intend to requisition some mains powered equipment (including battery chargers), please contact the technician supporting your project. Under no circumstances are you allowed to open or modify any mains powered equipment.

When you are preparing to conduct experiments that have not already been risk assessed, you must conduct a risk assessment and this must be agreed with the project supervisor before any work can be carried out. This is without exception. If you are in any doubt about the need for a risk assessment then talk to the project supervisor. Penalties will be applied to the work

of any students not undertaking appropriate risk assessments and adhering to health and safety procedures. This may also lead to formal disciplinary action.

Advice on how to complete a risk assessment form can be obtained from the project supervisor/technician responsible for your project.

5 Project Deliverables

5.1 Marking Criteria

Detailed marking criteria for each of the project deliverables are provided in Appendix 2 and a general guide to the marks attributable to different levels of attainment is given in Appendix 1. Please ensure you read the marking criteria in detail and that you cover all aspects of the marking criteria in each deliverable.

For each deliverable, marks are provided under various criteria based on the given guidelines. The comments by the marker will reflect how the deliverable has been marked to ensure that the student can understand the mark given and to provide advice on how to improve in the future.

5.2 Deliverables Style

All deliverables should be produced in a professional manner as if you are working in industry. They should not be written as academic documents. The primary audience for any deliverables is the Director of Research and Development of the company and other senior personnel and colleagues. You will receive further advice on this during the project management meetings.

5.3 Report Formatting

All reports should be word processed, professionally produced and submitted in pdf format. You should use either Arial or Calibri and 11 point type with at least 2 cm margins at the top/bottom and sides of the page. You should use 1.5 line spacing. Where a page limit (meaning number of A4 sides) is given this does not include the title page, abstract/executive summary, contents page, list of figures, list of tables, list of references or appendices. However, you should keep appendices to a minimum and they should only be used for additional information and not for information that is key to understanding the report. Appendices will not be marked so do not rely on them for important information.

All figures must be professionally produced and not hand drawn. Figures and tables should be numbered appropriately, referred to in the main text and include a long enough caption to be able to understand the figure/table without reading the main text, i.e. captions should be at least 1-2 sentences long.

You can use any correct referencing style (e.g. Harvard, IEEE). Library resources are very good guides to referencing in the (author, year) and [numbered] formats

Write professionally, do not use first person, i.e. “I” or “we”.

Do not underestimate how long it takes to compile a professional report where multiple authors are making contributions. It is recommended that you decide on the key formatting before anyone starts writing and that one person is made responsible for collating the report at the end. In particular it is recommended that you think about what referencing style and

approach to figure/table numbering will be easiest to collate across contributions from multiple authors.

5.4 Deliverable 1: Systems Engineering and Requirements

An essential part of this project is that it should be run as if you are in industry. Systems engineering is used by a number of companies to ensure their projects are successful and deliver the correct outcomes. Even in research and development projects of the type you are undertaking here, there are significant benefits in applying a systems engineering approach. Whilst there is insufficient time to undertake a full systems engineering approach in this project, the most important aspect, i.e. requirements engineering, is a key deliverable that will inform how you think about and execute the project.

You should put together, and maintain a short report (approximately 5-6 pages) that covers the following:

- Brief background to the specific project that you are undertaking together with clear aim(s) and objectives. This will demonstrate your specific understanding of the project and the objectives that you as a group want to focus on. These are likely to vary even within the groups doing the same project.
- Technical requirements definition. A detailed database/matrix that logically defines all of the technical requirements. This should be comprehensive including functional and non-functional requirements. Databases should include all relevant fields: ID; rationale; traced from; owner; verification method; verification lead; and verification level.

In addition, it is expected that these will be used as a live document during project management meetings and that an updated version will be presented as part of deliverables (Interim Report, Final Project Report).

5.5 Deliverable 2: Project Management

The success of a project depends critically on good project management and organisation. Based on the systems engineering and requirements in deliverable D1 you should produce and maintain a single report (approximately 5-6 pages) that covers the following:

Work breakdown structure (WBS): this is a key element of project management that decomposes the project into smaller components. The WBS should be deliverable-oriented and present a clear hierarchical decomposition of the project. Phases, deliverables and work packages should be clearly identified and sensible coding used throughout.

Gantt chart: based on the WBS this provides a task driven summary of a project across time and is the primary tool used to manage the project process. Should be logically structured so that it is easy to follow tasks and assign roles to tasks. Tasks should have clearly identified start and end times that are realistic and contingencies identified as appropriate. Relationships/dependencies between tasks should be clearly identified and appropriate resources required listed.

Risk register: all projects have risks and it is important to clearly identify these from the outset of the project and to update these during the course of the project. A risk register is a logical tool for risk management. This should identify all project risks, organised appropriately. The

likelihood and impact of risks should be scored and appropriate mitigation strategies identified. In order to ensure that risks are managed appropriately it is essential that the ownership of each risk mitigation is also clearly identified to ensure action is taken.

5.6 Deliverable 3: Poster Presentation

The presentations will be delivered by each group at the end of the project, on week 12. Each poster presentation should include sufficient detail for someone to appreciate the following:

- background context to the project, aims and objectives
- Design/modelling/simulation/experimental work on subsystems – how did you develop the subsystems for the overall demonstrator, why these subsystems, how did you evaluate the subsystems?
- Summary and evaluation of final demonstrator – how were the subsystems integrated, how was the final system tested, verified and validated, how did the system perform?
- Conclusions – summarise key conclusions on the demonstration, ideas for future work

Note the audience will include people from academia, as well as industry - other students will also be present. Any of these people may ask questions.

The approach to the presentation should assume that you are presenting to the Director of Research and Development and other key personnel in your company and therefore you should not be treating this as an academic presentation. It should be treated as an industrial presentation. It is really important to justify why you have made the choices you have made and to explain the results of your work and potential impact to the company.

5.7 Deliverable 4: Interim Report

The interim report should focus on your preliminary research, development of ideas, and description of the proposed design. You should use systems engineering methods to justify engineering choices and describe the overall project management. You should demonstrate evidence of a systems engineering approach to your work.

Again, you should assume that the demonstration is to the Director of Research and Development and other key personnel in your company. Think about demonstrating the potential impact to the company of your work. The interim report should therefore be composed of D1, D2 and a technical project progress.

5.9 Deliverable 5: Final Project Report

The final report should be focusing on the technical approach and final design/solution together with the research, simulations and experiments conducted.

The length of the report should be up to 30 pages, including

- Background, aims, objectives, literature review (an extension of the interim report content).
- Complete technical approach (methodology).
- Simulation results and analysis.

- Conclusions.

Depending on the type of project/challenge you undertake, you may need to include with your report a software /demonstrator as evidence of your work.

6 Project Management and Peer Assessment

6.1 Project Management Meetings

Throughout the project you will have formal project management meetings with the Director of Research and Development. The organisation and conduct of these meetings will be indirectly assessed throughout the project. This is effectively assessing the professional skills of the group and ability to work in an industrial capacity.

The assessment will take account of a range of factors including: professionalism and working relationships of the group members; organisation of the meetings including structure, agenda, and minutes; efficiency and focus of discussions; evidence of progress made since last meeting; technical discussions; use and update of systems engineering and project management documents.

In particular it is expected that live versions of the systems engineering (D1) and project management (D2) documents are discussed during meetings in addition to technical discussions.

6.2 Peer Assessment

Whilst this project is primarily about group work your individual contributions to the project will also be assessed. WebPA (or similar software) is typically used to undertake peer assessment in the group project, which is standard practice in the University. You should treat this seriously as this is an important part of your feedback and will inform self-reflection and how you and other members develop through the project.

Detailed information on WebPA is available from

http://webpaproject.com/webpa_wiki/index.php/Main_Page

An explanation of how WebPA calculates peer assessment is available at

http://webpaproject.com/webpa_wiki/index.php/The_Scoring_Algorithm

How to Undertake Peer Assessment

Two times throughout the semester (at the end of weeks 7 and 12) you will need to complete a peer assessment of the members of your group including yourself. This will take the form of a series of questions (see below) that you score for each member of the group. It will not take long to answer these questions and it is essential that you complete them every time. You will also have to provide brief comments to support your scores. Note that these comments will be provided (anonymised) to the relevant students so it is essential that they are professional and constructive. Abusive comments will be subject to disciplinary action.

Any students who do not complete peer assessment for any given period will receive a 10% penalty on their peer assessment score for that period.

Calculation of Peer Assessment Scores

All peer assessment marks will be equally weighted. This weighted average of the peer assessment scores will include any penalties for not submitting peer assessment scores in any period.

The weighted average peer assessment score for each group individual will be applied to all group assessment marks for that semester. This will be applied to only 50% of the group mark, i.e. you will receive 50% of the unaltered group mark + 50% of the group mark weighted by your peer assessment score. Your mark for each group deliverable will therefore reflect the overall mark for that deliverable together with the peer assessment of your contribution during the semester. Note that you may contribute differently to different deliverables; peer assessment should assess your overall contribution and therefore take account of the fact that workloads may be imbalanced for good reasons across different deliverables.

Peer Assessment Feedback

You will be provided your scores and feedback from other students ongoing throughout the semester as a form of feedback. Based on these scores it is expected that you discuss how the rest of the group have assessed your contributions to help you review your contribution to the project in order to develop.

Questions

For each peer assessment period you should assess each group member's contribution to the overall project in the following areas. Note that the nature of the work will vary through the course of the project including the time spent working on specific deliverables. These four questions are a guide to how you should peer assess the other group members in broad areas of relevance to the project and should take account of work in preparing deliverables as appropriate. Note that for each question the "average" answer does not always have the same number. It is also important to note that it is the relative responses across group members that affects the peer assessment (so responding with "5" to all questions for all group members will not lead to everyone getting high peer assessment scores).

Q1. Please rate each group member's overall contribution to meetings:

1. Regularly does not attend, arrives late and/or contributes little or nothing to discussions.
2. Attends some meetings and/or contributes little to the discussion.
3. Attends some meetings but contributes well to discussions when present or attends all meetings but contributes little.
4. Attends most/all meetings and contributes to discussions and ideas.
5. Attends all meetings, actively contributes with ideas and to discussions and actively encourages other members of the group to contribute.

Q2. Please rate each group member's technical contribution to the project:

1. Has made little technical contribution and/or work is technically weak.
2. Has made some contribution, requires lots of support and encouragement from the group to undertake work and/or work is sometimes technically weak.
3. Reasonable contribution, technically solid and gets on with their work as requested.
4. Good contribution to the project, technically solid and demonstrates good initiative.

5. Excellent contribution to the project that is technically very good, demonstrating excellent insight and initiative.

Q3. Please rate each group member's contribution to the project management and systems engineering:

1. Poor project management and little or no systems engineering approach applied.
2. Has made some contribution to project management and systems engineering, but requires lots of support and encouragement from the group to do this.
3. Reasonable contribution, makes use of appropriate project management and systems engineering tools but could be more effective in their use.
4. Good contribution to the project management including updating documents regularly as the project progresses. Good use and understanding of appropriate systems engineering tools.
5. Excellent project management and use of systems engineering tools including making regular updates to documents.

Q4. Please rate each group member's overall professionalism and group working skills:

1. Does not engage well with the group, acts unprofessionally and is not supporting the group in the project.
2. Engages most of the time but could do more to contribute to the group.
3. Solid group member, professional and respects and supports other group members.
4. Very good group member, professional, supports other group members and contributes more than others on average.
5. An excellent team player and communicator, actively encourages and supports other group members and contributes well beyond expectations.

7 Further Information on Feedback and Assessment

7.1 Feedback and Reflection

An important part of your learning and development is feedback and subsequent personal reflection. Throughout the project you will receive feedback in different forms and you should use this feedback to reflect on your progress, contributions, overall performance and how you can improve. In particular the following approaches to feedback will be used in this project:

- Yourself – you should continually be reflecting on how you are contributing to the project and the group. Personal reflection is one of the most important forms of feedback and should be based on the other forms of feedback below but also based on your own thoughts. You should update the logbook weekly and also use the personal reflection to help with this.
- Informally from your fellow group members – you should provide each other with feedback on how you are doing and contributing to the project. In particular if a group member is not contributing as they should be then it is the responsibility of the rest of the group to provide feedback to them on how they can improve.
- Peer assessment – peer assessment will be used to allocate each semester's group marks to individuals in the group. You will be informed of your ongoing peer assessment scores and this will be a valuable way to assess how the rest of the group

perceive your contribution. You should use this to reflect on your contributions and to have more detailed discussions with your group.

- During project management meetings – as a group and individuals you will receive ongoing feedback via these meetings.
- Formal deliverables – you will receive marksheets (see Appendix) no later than 2 weeks after each deliverable is submitted. These will include detailed mark breakdowns under the appropriate headings together with written feedback. In addition you will receive verbal feedback in the next appropriate project management meeting. For full details on feedback on formal deliverables see Section 2.
- After the presentation– you will have the opportunity to reflect on how the presentation went including the discussion with industry.

7.2 Unfair Means

The use of unfair means, e.g. plagiarism and collusion, is strictly forbidden. Students are warned that the piece of work affected may be given a grade of zero, which in some cases will entail failure of your project. Electronic software (e.g. Turnitin) may be used to check for unfair means. It is the responsibility of all group members to ensure that no unfair means have been used in the production of any group deliverables. If unfair means are found in any group element of the project then all group members will be penalised.

You should thoroughly read and understand the information at https://www.sheffield.ac.uk/ssid/exams/plagiarism, including the University's guidance to students on unfair means download. If you are at all unsure about what this means and the implications for your work, then you should consult the module leader.

7.3 Use of Material from Earlier Reports in Later Reports

It is expected that to a greater or lesser extent, material from the earlier reports will be used in later reports. However, it is also expected that students will have significantly built upon the work reported in earlier reports when submitting later reports. You will not be penalised for self-plagiarism for reusing text from earlier reports in later reports, but if you do not significantly expand on the earlier work you are unlikely to get a good mark. NB. This only applies to reports in ACS6402/03. Direct use of work from other modules in ACS6402/03 will be treated as unfair means, i.e. self-plagiarism.

7.4 Extensions

Applications for extensions to the submission date for any assessed component of the project must be made directly to the module leader via email. This email must contain the reason for the requested extension. Before an extension is formally granted a completed extenuating circumstances form (available from the SSID pages of the university website - http://www.sheffield.ac.uk/ssid/forms/circs) must be submitted. Full details on the ACSE extenuating circumstances procedures are available at https://www.sheffield.ac.uk/acse/current/illness).

Please note that extensions will only be granted if a student/group cannot reasonably submit the specified assessed component within the original deadline and can provide a valid reason supported by appropriate evidence. Typically, extensions will only be granted in the event of medical and/or personal circumstances beyond the control of the student and requests for

extensions should be made as early as is feasibly possible. In the case of a single student needing an extension, the rest of the group should complete as much of the deliverable as possible and still submit this by the original deadline. Failure to have backed-up your data and poor planning so that everything is being done at the last minute are not valid reasons. The decision of the module leader will be final in all requests for extensions.

7.5 Penalties for Late Submission

Late submission will result in a deduction of 5% of the total mark awarded for each working day after the submission date.

Day late	Marked reduced by 5%	Mark Awarded when reduced by 5%*	
	Multiply by	Original 60	Original 50
1	0.95	57	47.5
2	0.90	54	45
3	0.85	51	42.5
4	0.80	48	40
5	0.75	45	37.5

** Standard mathematical rounding rules should be applied and marks should be rounded up.*

The 5 working day deadline for late submission is absolute and any work submitted after the 5 working day period without a special dispensation will receive zero.

For further information see http://www.shef.ac.uk/ssid/exams/policies.

For group submissions it is the responsibility of the whole group to ensure that deliverables are submitted on time. If the group allocates one member of the group to submit the work and it is submitted late then the whole group will receive the late penalty. This is particularly important to bear in mind for the final group report which includes significant individual contributions. If one or more members of the group have not completed their section by the deadline then the whole report should be submitted in whatever state it is in by the deadline and then any individual work that is not complete needs to be emailed directly to the module leader and the relevant individual students will be penalised for late submission.

Appendix 1 – Assessment: General Grade Descriptors for Projects & Reports

I **(70 -100)**	● Extensive **knowledge** of the subject area and the engineering context. A perceptive and focused use of the relevant material. Widespread evidence of independent sourcing and original thought. ● Shows an insight and depth of **understanding,** including an awareness of the complexities and subtleties. ● Very high standard of critical **analysis** and evaluation. ● Clearly structured **presentation**, showing logical development of arguments and properly referenced data and examples.
II:1 **(60 - 69)**	● A sound **knowledge** of the subject area and engineering context. A comprehensive use of the relevant material with some evidence of independent sourcing and original thought. ● Shows an **understanding** of arguments, contribution and context, including some awareness of the complexities and subtleties. ● High standard of critical **analysis** of the source material. Evidence of some evaluation and synthesis. ● Clearly structured **presentation**, showing logical development of arguments and properly referenced data and examples.
II:2 **(50 - 59)**	● Some **knowledge** of the subject area and engineering context. Makes some use of the relevant material with little or no evidence of independent sourcing, or original thought. ● Shows some **understanding** of arguments, contribution and context. ● Attempts **analysis** of the source material but may include some errors/omissions. Little evidence of evaluation and synthesis. ● P**resentation** reasonably clear with arguments not fully developed and data and examples not fully referenced.
III **(45 - 49)**	● Some **knowledge** and appreciation of the engineering context. Superficial use of the material provided. No evidence of independent sourcing, or original thought. ● Some areas of **understanding** of the arguments, contribution and context. ● Confused **analysis** including errors and omissions. No evidence of evaluation and synthesis. ● Descriptive **presentation** based on confused arguments. Includes poorly referenced data and examples provided during the lecture.
Pass **(40 - 44)**	● Limited and patchy **knowledge** and appreciation of the engineering context. Poor use of the material provided. No evidence of independent sourcing, or original thought. ● Limited **understanding** of the arguments. No understanding of the contribution and context. ● Confused **analysis** including a number errors and omissions. No evidence of evaluation and synthesis. ● Descriptive **presentation** based on confused arguments. Poor use of data and examples provided during the lecture. No references
Fail **(0 - 39)**	● Inadequate **knowledge** and no appreciation of the engineering context. Poor use of the material provided. No evidence of independent sourcing, or original thought. ● Inadequate **understanding** of the arguments, contribution and context. ● Inadequate grasp of the **analysis** including many errors and omissions. No evidence of evaluation and synthesis. ● P**resentation** that contains no data, examples or even class notes.

Appendix 2 – Detailed Marking Criteria

ACS6402 - ITP

D1: Systems Engineering and Requirements

Group

INFORMATION ON THIS FORM WILL BE MADE AVAILABLE TO THE STUDENTS

	Marks
Background, aims and objectives: summarises the key background to the work, clear aim(s) and objectives, top level requirements clearly identified	/10
Technical requirements definition: well organised and database includes all fields, evidence of functional and non-functional requirements	/10
Total	**/20**

Comments:

Signature…….

Date……

ACS6402 – MSc ITP

D2: Project Management

Group

INFORMATION ON THIS FORM WILL BE MADE AVAILABLE TO THE STUDENTS

	Marks
Work Breakdown Structure: presents clear hierarchical decomposition of project, phases, deliverables and work packages clearly identified, sensible coding used for breakdown, logical structure, follows logically from requirements	/5
Gantt chart: project decomposed into logical tasks, clearly defined start and end times to tasks, relationships between tasks highlighted, logical structure and organisation of Gantt chart, contingency clearly highlighted	/10
Project risk register: identifies broad range of project risks, organised appropriately, likelihood and impact clearly and appropriately scored, mitigation and ownership clearly stated	/5
Total	**/20**

Comments:

Signature…….

Date……

ACS6402 - MSc ITP

D3: Interim Report

Group:

INFORMATION ON THIS FORM WILL BE MADE AVAILABLE TO THE STUDENTS

	Marks
Literature review: relevant literature, well referenced, literature review well structured, critical appraisal of literature	/20
Proposed system design: clear and logical ideas, proposed design solution well explained, preliminary work undertaken, what theoretical, computational or experimental work was carried out, well explained and critically appraised, demonstrates wide range of high level skills, knowledge and understanding, conclusions drawn	/30
Style and presentation of the report: organisation, clarity, referencing, consistency and quality of presentation, good use of English, figures, tables.	/10
Total	**/60**

Comments:

Signature…….

Date……

ACS6402 - MSc ITP

D4: Poster Presentation

Group:

INFORMATION ON THIS FORM WILL BE MADE AVAILABLE TO THE STUDENTS

	Marks
Visual aids: appropriate use of slides, not cluttered, good mix of text and figures, easily readable	/20
Technical work: evidence of design, modelling, simulation, experimental work, clarity on the justification of methodologies used.	/30
Final solution: testing and evaluation of final solution, analysis of results, how did the final solution perform and meet the original requirements?	/30
Response to questions: ability to answer questions, logical/correct answers	/20
Total	**/100**

Comments:

Signature…….

Date……

ACS6402 - MSc ITP

D5: Final Report

Group:

INFORMATION ON THIS FORM WILL BE MADE AVAILABLE TO THE STUDENTS

	Marks
Introduction and background: well-motivated, background to problem area, clear aims and objectives, relevant literature, appropriate references	/20
Technical approach: justification for technical approach, in-depth description, scientifically sound, relevance and application to case study	/30
Results, analysis and conclusions: Demonstration of efficiency of technical approach, have the requirements been achieved, to what extent? Analysis of results, conclusions.	/40
Style and presentation of the report: organisation, clarity, consistency, referencing, quality of presentation, use of English, figures, tables	/10
Total	**/100**

Comments:

Signature…….

Date……

Appendix 3 - Module Learning Outcomes

ACS6402

By the end of the module students will be able to:

- [LO1] Identify system design changes in advanced manufacturing systems, in order to improve performance when specific components are manufactured and used in service (EA1fl, EA2fl).
- [LO2] Identify, apply and analyse the technical approach needed to assess the performance of a specific manufacturing task and how to disseminate the findings and handle the data in an effective manner (EA3fl, D2fl).
- [LO3] Demonstrate a general understanding of advanced manufacturing and appropriate process monitoring techniques for the manufacture of critical components (D1fl).
- [LO4] Accept responsibilities, formulate ideas proactively, deal with open-ended and unfamiliar problems, plan and develop strategies, implement and execute agreed plans, lead and manage teams where required, evaluate achievement against specification and plan, and decision-making (D3fl, ET1fl, ET2fl, ET3fl, ET4fl, ET5fl, ET6fl).

ACS6403

By the end of the module students will be able to:

- [LO1] Identify system design changes in advanced manufacturing systems, in order to improve performance when specific components are manufactured and used in service (EA1fl, EA2fl).
- [LO2] Identify, apply and analyse an appropriate Computational Intelligence technical approach needed to assess the performance of a specific manufacturing task and disseminate the findings (EA3fl, D2fl).
- [LO3] Demonstrate a general understanding of advanced manufacturing and Computational Intelligence - based process monitoring techniques for the manufacture of critical components (D1fl).
- [LO4] Accept responsibilities, formulate ideas proactively, deal with open-ended and unfamiliar problems, plan and develop strategies, implement and execute agreed plans, lead and manage teams where required, evaluate achievement against specification and plan, and decision-making (D3fl, ET1fl, ET2fl,ET3fl, ET4fl, ET5fl, ET6fl).

Both modules satisfy the AHEP3 (Accreditation of Higher Education Programmes, Third Edition) Learning Outcomes that are listed in brackets after each learning outcome above.