

CONFIDENTIAL

EXAMINERS' REPORTS 2016

MATERIALS SCIENCE (MS)

MATERIALS, ECONOMICS & MANAGEMENT (MEM)

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REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

Category	Number			Percentage		
	2015/16	2014/15	2013/14	2015/16	2014/15	2013/14
Distinction	10	8	10	31	25	30
Pass	22	23	18	69	72	55
Fail	-	1	5	-	3	15

Marking of scripts

Scripts are single marked except for borderline cases which are double-marked.

B. NEW EXAMINING METHODS AND PROCEDURES

No new examining methods and procedures this year.

C. Please list any changes in examining methods, procedures and conventions which the examiners would wish the faculty/department and the divisional board to consider.

It is obvious in MS1 and MS2 that students pick certain courses to answer and ignore others (in particular electromagnetism), to prevent this questions could be put into sections.

Average marks are considerably higher at Prelims than Finals. Previous examiners have suggested making examinations “harder” and this was considered when composing the papers, however students performed even better this year! Students are very good at the knowledge and understanding elements of the paper but most find problem solving questions challenging. If a student hasn’t met a similar question in a past paper or tutorial, they struggle. To improve on this Faculty could consider stipulating that half to a third of marks are to be for problem solving questions. For example the question could include new information for the student to consider. This “new information” could be as simple as relationship they haven’t met in lectures. From here a problem solving question could be developed. The purpose would be to match the spread of marks to that awarded at Finals.

D. Please describe how candidates are made aware of the examination conventions to be followed by the examiners

Circulation by Deputy Administrator (Academic) to all students and tutors by e-mail, hard copy, and onto the Departmental website.

A copy of the conventions for this examination is attached below.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

32 students were registered for the examination.

All 32 candidates passed all papers, without the necessity for compensation. Of the total of 32 successful candidates in June, 10 were awarded Distinctions, all with marks of 78.5% or more (rounded). This year two more distinctions were awarded and all students passed.

The prize for the best overall performance in Prelims was awarded to Sahasrajit Ramesh, of St Anne’s College. The prize for the best performance in 1st year Practicals was awarded to Rachel Kealy of St Anne’s College. Additional prizes for outstanding performance were awarded to Yuxin Yin of Mansfield College and Yujin Lim, of Corpus Christi College.

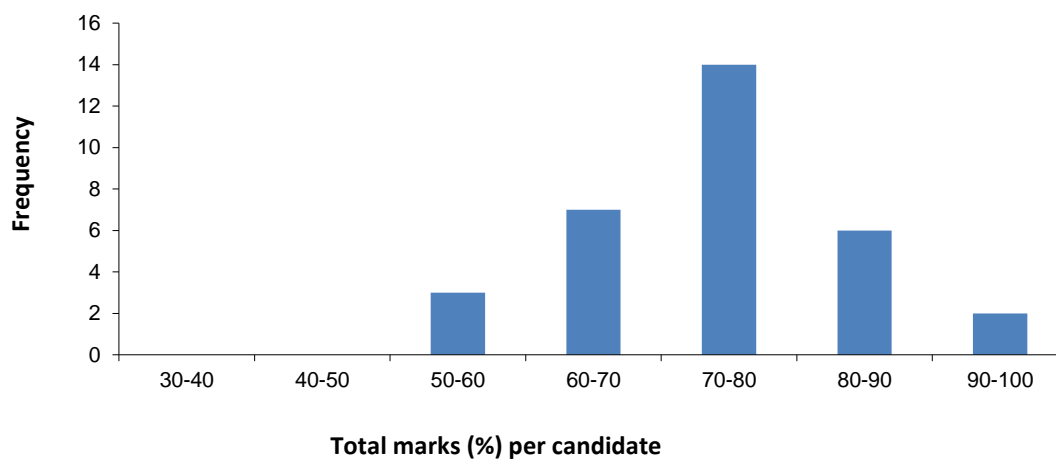
MS1 – Structure of Materials

Examiner: Professor Nicole Grobert
Candidates: 32
Mean mark: 74.16 %
Maximum mark: 91%
Minimum mark: 54%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	30	17.47	20	10
2	24	13.25	18	6
3	21	14.38	20	7
4	24	15.00	19	9
5	14	11.93	19	7
6	16	14.63	20	6
7	6	13.17	16	9
8	25	15.56	20	7

Prelims 2015/16 Materials Science 1



General comments:

1. The overall performance in MS1 was strong and reasonably well balanced. Only three candidates scored in the high 50ties and an impressive number of candidates scored in the high 80ties and lower 90ties.
2. Question 1 was the most popular question attempted by 30 candidates. The least popular were Question 7 (only 6 candidates), followed by Question 5 and 6 with almost half of the cohort attempting the latter two. The highest average mark 17.47 was achieved in Question 1.
3. Unlike in previous years, the candidates seemed to have been less strategic about selecting the questions, which is a positive trend. Yet, there appears to be still general preference towards essay type questions.
4. The most irritating aspect was related to very poor handwriting, messy sketches/graphs, and students writing several questions in one booklet, splitting individual questions across different booklets not always clearly indicating the number of the question.

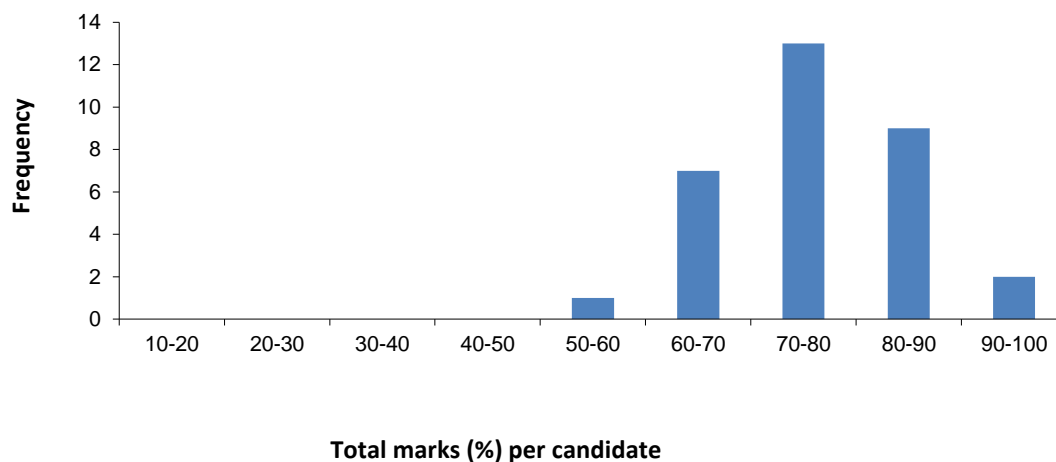
MS2 – Properties of Materials

Examiner(s): Professor Jamie Warner
Candidates: 32
Mean mark: 76.44%
Maximum mark: 92%
Minimum mark: 57%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	7	14.29	18.5	9.5
2	30	13.02	17.5	6
3	22	15.75	19	11
4	10	12.65	18	2
5	10	13.85	20	5
6	24	16.31	20	11
7	31	17.18	20	8
8	26	15.77	20	5.5

Prelims 2015/16 Materials Science 2



General Comments

1. This question had the lowest number of attempts and the average mark is amongst the lowest. A high score was obtained by some, indicating that the question is viable if the content is studied.
2. A very popular question, but the average score is quite low compared to the other questions.
3. A solid number of attempts and a relatively high average score for this question.
4. A low number of attempts and also the lowest average score
5. A low number of attempts and also the average score is amongst the lowest.
6. This question was popular and the average score is amongst the highest.
7. This question had the highest average mark and was also the most popular question.
8. A popular question with an average score that was high.

General comment:

The mean mark is higher than in previous years. The maximum mark and minimum mark are also higher than in previous years. There is a clear separation between the popularity of questions. Questions 1, 4 and 5 had the lowest number of attempts compared to the other questions. The average mark for these three questions was also low, compared to the other questions. The lack of students doing questions on electromagnetism is consistent with previous years and this trend will continue to happen unless the exam layout is changed.

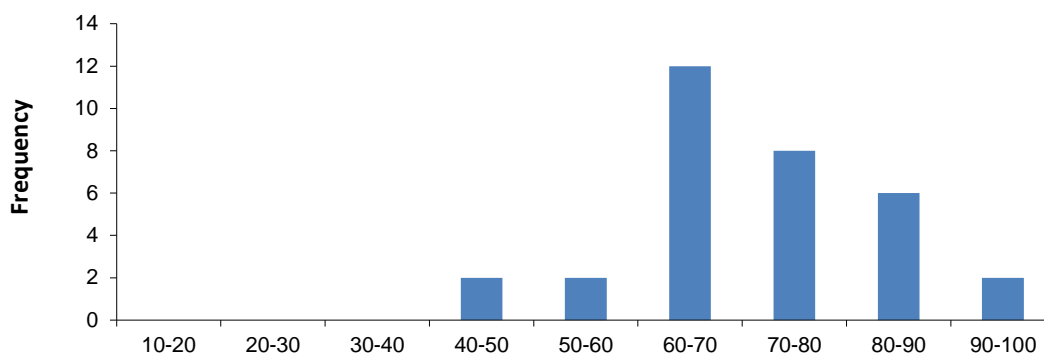
MS3 – Transforming Materials

Examiner(s): Professor Susie Speller
Candidates: 32
Mean mark: 71.75%
Maximum mark: 93%
Minimum mark: 45%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	11	14.55	19	3
2	9	14.78	17	8
3	20	13.65	18	1
4	29	15.14	20	11
5	25	13.44	19	9
6	27	12.89	18	5
7	17	15.24	20	7
8	22	15.82	18	13

Prelims 2015/16 Materials Science 3



Total marks (%) per candidate

General Comments

There was a reasonably good spread of questions attempted by the candidates, and the average marks were high. In general, the questions were too predictable, with several standard derivations and basic arguments that the students could reproduce easily. The parts of the questions which the students found most challenging involved explaining particular observations/results.

Questions

- 1) **Polymer synthesis.** A relatively unpopular question. (a) Cationic polymerisation of isobutylene: generally good answers showing understanding of the classification of different polymers and polymerisation processes. (b) Molecular weight calculation: the number average was usually calculated correctly, some candidates quoted the formula for the weight average and applied it correctly, and a few candidates derived the formula.
- 2) **Processing.** The least popular question. Most candidates described the different processes accurately, but often the answers were not sufficiently detailed.
- 3) **Thermodynamics.** This question was about isothermal and adiabatic expansion of an ideal gas. Most candidates knew about reversible and irreversible isothermal expansion, but some had difficulty with adiabatic expansion. The derivations in c(i) and c(ii) were generally good, but the candidates found it difficult to interpret the results in c(iv).
- 4) **Thermodynamics.** This question, about spontaneous processes and Gibbs free energy, was the most popular and the candidates achieved high average marks. Several standard derivations were included, which the students could easily reproduce. The main difficulties were encountered in d(ii), which was a more open ended question about reduction of metal oxides. There were a few very good answers to this, but many students did not give clear explanations.
- 5) **Microstructures.** This question was about a generic A-B binary eutectic system. The candidates could draw and label the phase diagram and sketch consistent Gibbs free energy curves. The candidates did not perform so well on part (c) about non-equilibrium solidification, and some had completely misunderstood. Answers to part (d) were also relatively poor, with very few candidates understanding the effect of faceting on eutectic microstructures.
- 6) **Microstructures.** This was a very popular question on nucleation of a solid in a liquid, with the lowest average mark. In the main, the candidates could reproduce the derivations in (b) and (c), though some did not explain the steps carefully. Several candidates thought that there would be a smaller critical radius for heterogeneous nucleation. Part (e) was the most challenging part of the question, with few candidates understanding dendrite formation in pure material.
- 7) **Reaction kinetics.** This question related to determining the order of reactions. Most candidates understood the isolation method and the initial rates method. Some students made errors in the calculation in (c), but the majority took a sensible approach.
- 8) **Electrochemistry.** A straightforward question with the highest average mark. The candidates could, in general, write down the half-cell equations and the overall reaction. However, there were quite a few students who were confused about calculating the cell voltage, with either incorrect signs or attempts to take into account the number of moles in each half cell reaction. The Nernst equation calculation in (b) was done well.

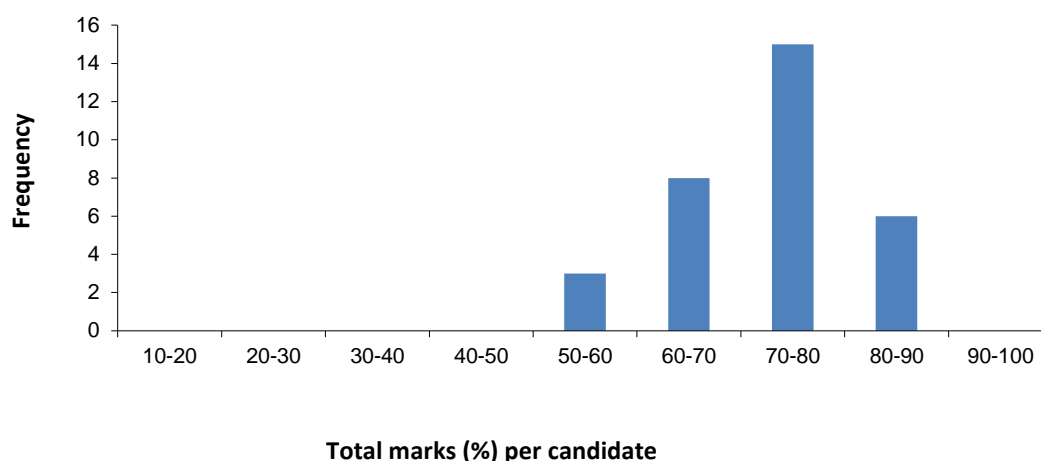
Mathematics for Materials Science

Examiner(s): Professor Andrew Watt
Candidates: 32
Mean mark: 73.06%
Maximum mark: 86%
Minimum mark: 54%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	32	6.72	8	4
2	32	6.84	8	4
3	32	7.66	8	5
4	32	5.00	7	2
5	30	3.87	8	1
6	31	6.55	8	3
7	30	5.77	7	3
8	31	6.06	8	3
9	26	4.38	8	1
10	28	5.61	8	1
11	24	20.04	24	11
12	32	20.22	25	4
13	6	14.83	25	4
14	23	20.04	25	9
15	19	14.68	22	5
16	23	13.13	23	4

Prelims 2015/16 Maths



General Comments

Very high mean and minimum mark, this suggests that the paper was too easy. Marks are however well distributed indicating differing abilities are differentiated. Students struggled with problem solving elements that required them to think beyond the standard questions sets. Lecturers set the questions and solutions using a combination of Microsoft word and LaTeX this meant that the examiner had to transcribe some questions this led to four small typographical mistakes appearing in the paper. The mistakes were indicated to the students during the exam and taken account of when marking. In future lecturers should be made to write questions in Word.

Questions:

- 1) Reasonably well done calculus question though some student struggled on where to start.
- 2) Generally well-done question on sketching a function, some silly mistakes.
- 3) Vectors question very well done however numerical errors let some students down
- 4) Finding the inverse of a matrix, extremely well or badly done, quite a spread of marks.
- 5) Another matrices question, some high marks but some candidates clearly do not get the subject. A lot of working was expected for very few marks.
- 6) Boiler-plate question on integration which many students learnt by rote.
- 7) Standard calculus question mostly good attempts.
- 8) Another standard calculus question mostly good attempts.
- 9) Complex numbers well answered.
- 10) Interesting question on working out moment of inertia, some good answers but few perfect answers many did not take account of the weight change.
- 11) Very well done extended calculus question, felt like students recalling from memory.
- 12) Reasonably well done calculus question, some very poor answers.
- 13) Least popular question of the paper on Taylor series, some students did excel though.
- 14) Well done definite integral question to calculate inertias, students like this part of the course.
- 15) Very wordy question on matrices which gained a low average mark, a lot of work for the marks.
- 16) Matrices question which was reasonably popular.

Examination Conventions 2015/16

Preliminary Examination in Materials Science

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence.

The examiners are nominated by the Nominating Committee* in the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. In Prelims the examiners are called “moderators”. Formally, moderators are independent both of the Department and of those who lecture. The paragraphs below give an indication of the conventions to which the moderators usually adhere, subject to the guidance of other bodies such as the Academic Committee in the Department, the Mathematical, Physical and Life Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to the moderators.

The Moderators in Trinity 2016 are: Prof Andrew Watt (Chair), Prof. Nicole Grobert, Prof. Susie Speller and Prof. Jamie Warner. It must be stressed that to preserve the independence of the Moderators, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via your college, who will, if the matter is deemed of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Prelims.

If there are believed to be mitigating circumstances, such as illness, which may have affected the candidate’s progress with coursework or performance in a written exam these should be drawn to the attention of the candidate’s college as soon as practicable. Candidates should complete the form entitled ‘Factors affecting performance in examinations’ and submit this to the college with appropriate supporting material. The Senior Tutor of the college will submit the application to the Registrar for forwarding to the Chairman of Prelims for consideration according to Part 13 of the ‘Regulations for the Conduct of University Examinations’ section of the Examination Regulations 2015/16.

(1) *Setting of papers*

Each of the five papers in Prelims, comprising the 3 Materials Science papers (MS1, MS2 & MS3), the Maths for Materials Science paper, and the Coursework Paper, are weighted equally towards the overall total for the Preliminary Examination. The Moderators set the papers, but are advised to consult the course lecturers. The course lecturers are required to provide draft questions and model answers if so requested by the Moderators. There are no external examiners for Prelims. The assessed work for the practicals and the crystallography classes together constitute the Coursework Paper.

(2) *Written Paper Format*

The Materials Science papers 1 - 3 comprise eight questions from which candidates must attempt five. Each question is worth 20 marks. The total marks available for each of these papers are 100.

The Prelims paper on Maths for Materials Science consists of two sections, candidates are required to answer all questions in Part A and 4 from Part B. The total marks available for this paper are 180; the mark achieved then being weighted by a factor of 0.555’ such that the paper contributes a maximum of 100 marks to the Preliminary Examination.

* for the 2015-16 examinations the Nominating Committee comprised Prof Grovenor & Dr Taylor.

(3) Coursework paper

The Coursework Paper comprises two elements of coursework: a set of eight reports of practical work as specified in the MS Prelims Handbook (normally each individual report within the set has been marked already as the laboratory course progresses); and a set of reports for crystallography (completed under the class schedule). The Examination Regulations stipulate a specific date for submission of the practical coursework. Rules governing late submission of the practical element of coursework and any consequent penalties are set out in the 'Late submission and non-submission of a thesis or other written exercise' clause of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (Part 14, 'Late Submission, Non-submission, Non-appearance and Withdrawal from Examinations' in the 2015/16 Regulations).

Under the provisions permitted by the regulation, late submission of an element of coursework, as defined above, for the Preliminary Examination in Materials Science and Materials, Economics & Management will normally result in one of the following:

- (a) With permission from the Proctors under para 14.7 no penalty.
- (b) With permission from the Proctors under paras 14.9 and 14.10, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work, and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Examiners with due consideration given to the circumstances and to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners". The reduction may not take the mark below 40% of the maximum available for the piece of work.
- (c) Where the candidate is not permitted by the Proctors to remain in the examination, he or she will be deemed to have failed the examination as a whole.
- (d) Where, without the permission of the Proctors under paras 14.9 and 14.10, work is proffered so late that it would be impractical to accept it for assessment a mark of zero shall be recorded and, as per the Special Regulations for the Preliminary Examination in Material Science, normally the candidate will have failed the Examination as a whole.
- (e) Where no work is submitted a mark of zero shall be recorded and, as per the Special Regulations for the Preliminary Examination in Material Science and Materials, Economics & Management, normally the candidate will have failed the Examination as a whole.

Where an element of coursework is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Moderators, permit the candidate to remain in the examination. In this case for the *element of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires a minimum mark of 40% if the candidate is not to fail the examination as a whole.

Elements of coursework comprising more than one individual piece of assessed coursework

Penalties for late submission of individual practical reports are set out in the MS Prelims Handbook and are **separate** to the provisions described above.

The consequences of late submission of or failure to submit individual practical reports or individual pieces of Crystallography coursework are set out in the Prelims Handbook (sections 9.6 and 10 of the 2015/16 version) and are **separate** to the provisions described above.

(4) *Marking of papers*

For prelims double marking is not necessarily double “blind” marking. It is usually considered sufficient for the second marker merely to check the first marker’s marks.

The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on their cover sheet which questions, up to the prescribed number, they are submitting for marking. Excepting section A of the Maths paper, for which all questions are compulsory, if the cover slip is not completed then the examiners will mark the questions in numerical order by question number. If the candidate lists more than the prescribed number of questions then questions will be marked in the order listed until the prescribed number has been reached. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2 above will be awarded and (iii) the mark for the paper will still be calculated out of 100 for MS1, MS2 & MS3 and out of 180 for the Maths for Materials Science paper.

(5) *Marking of course practicals and crystallography classes*

First year practicals are assessed regularly by senior demonstrators in the teaching laboratory. The work done for crystallography classes is assessed by the Crystallography Class Organiser(s). Satisfactory performance in the practical work and in the crystallography classes is defined in the MS/MEM Prelims Handbook.

(6) *Classification*

The pass/fail border is at 40%.

The Moderators may award a distinction to recognise especially strong overall performance. Normally (i) at their discretion, the moderators may specify a mark in the range 70% to 79% such that candidates with an overall mark greater than or equal to this specified mark are awarded a distinction and (ii) a distinction will be awarded to all candidates with an overall mark of 80% or greater.

Failure in one or two written papers may be compensated by better performance in other written papers provided the candidate obtains at least 35% on the failed paper. Failure of three papers precludes compensation. Where compensation is permitted, only those marks in excess of 40 on a passed paper may be used towards compensation and normally this shall be at a rate of 3 marks to every deficit mark to be compensated.

For example, if two written papers are passed and marks of 36% and 38% are obtained in the remaining two written papers then the total for the four written papers must be at least 172 marks $\{36 + 38 + 2 \times 40 + 3 \times (4+2)\}$ for both failures to be compensated

The Moderators have the authority to use their discretion and consider each case on its merit.

(7) *Failure of one or more Papers*

Failure of the coursework paper will normally constitute failure of the Preliminary Examination. Materials coursework cannot normally be retaken. Exceptionally a candidate who has failed the coursework may be permitted jointly by the Moderators and the candidate’s college to retake the entire academic year.

Candidates who pass the coursework paper and fail 1 or 2 written papers will be asked to resit only those written papers.

Candidates who pass the coursework paper and fail more than 2 written papers will be asked to resit all 4 written papers.

The resits usually take place in September. To pass a resit paper the candidate must obtain at least 40%, and normally no compensation is allowed. There is only one opportunity to resit the examination, and failure to pass a resit examination normally results in the candidate being prevented from continuing to Part I. Exceptionally, a college may allow a student to go down for a year and take Prelims a second time the following June.

The Moderators have the authority to use their discretion and consider each case on its merit. In such cases they will take into account a candidate's profile across all elements of assessment together with, subject to guidance from the Proctors where appropriate, any other factors they deem to be relevant.

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS SCIENCE, PART I EXAMINATION

Part I

A. STATISTICS

(1) Numbers and percentages in each category

The Part I Examination in Materials Science is unclassified. No distinctions are awarded.

Category	Number			Percentage		
	2015/16	2014/15	2013/14	2015/16	2014/15	2013/14
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	33**	28*	26	100**	100*	100
Fail	0	0	0	0	0	0

* Four of these candidates failed to achieve an Honours Pass and therefore could not progress directly to Part II

** One of these candidates failed to achieve honours pass (and had previously also failed to achieve honours in 2014/15) and so will not progress to part II.

(2) If vivas are used

As stated in the Examination Conventions, vivas are no longer used in the Part I examination.

(3) Marking of scripts

All scripts were double-blind marked by the Examiners and Assessors. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

New procedures for dealing with mitigating circumstances, such as illness to a candidate, were introduced across the University as described in Part 13 of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations 2015. This change was captured in the Examination Conventions distributed to candidates.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

The new procedures for dealing with 'Factors Affecting Performance' (FAPs) should be reconsidered. Last year's examiners reported:

1. Mechanisms for ensuring consistency in responding to FAPs from year to year and between Examination Boards need to be established. Devolving decision making to the individual Examination Boards is likely to generate inconsistency in how mitigating circumstances are treated, which may in turn risk the University's reputation for fairness. A more centralised process at Divisional or University level would help achieve a consistent approach and be more in line with other institutions.
2. The wealth of experience in dealing with mitigating circumstances accumulated over many years within the Proctors Office is not available within the individual Examination Boards. Serious consideration should be given to returning FAPs to the Proctors Office and if necessary increasing the resource available there.

This year's examiners (five out of six of whom differ from last year) endorse these points. We recognise that the Examiners are best placed to assess how marks may be adjusted given a case, but only once a case has gone through the Proctors office to assess the validity and impact and conduct to any further enquiries.

A consequence of the new FAP process is that it places the burden on the student to ensure the provision of all material that can be considered, including in getting other bodies (college, doctor etc.) to submit information on their behalf at a time when they are likely coping with the effects of illness or particular difficult circumstances that affect their performance to be able to do such things. This contrasts with the previous system in which further clarification or evidence could be sought if necessary. This would appear to be an unacceptable deterioration in fairness to the students.

In contrast to last year, the examiners decided to make specific recommendations at Part I without carrying forward decisions to be completed in conjunction with the Part II mark, to enable all candidates to know their Part I mark ahead of starting their Part II project.

D. EXAMINATION CONVENTIONS

The current year's Conventions were put on the Departmental website and sent electronically, along with other information in a letter from the Chair of Examiners to all candidates on 08 March 2016. The Examination Conventions were agreed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 33 candidates for the examination, 32 of these were awarded Honours. The examination consisted of six written papers plus coursework that included a team design project, a business plan, industrial visit reports and practical work carried out during the 2nd year. Three candidates opted to take a supplementary subject; eight candidates opted to take the Foreign Language Option. These replaced the business plan. In addition, candidates completed further coursework in the 3rd year in the form of either a module on Materials Characterisation (eleven candidates) or one on Materials Modelling (twenty-two candidates). There was one candidate returning from withdrawal to sit the written papers who was not required to redo coursework already completed. There were four candidates who re-entered for Part I this year, having failed to meet the examiners' requirements to progress to Part II last year. Three of these candidates were required to re-sit the written papers; the fourth candidate was required to re-sit the written papers as well as the practical work and team design project.

Each written paper lasted three hours. For the General Papers, candidates were required to answer five questions out of eight, as in previous years. For Options Paper 1, candidates were offered ten questions in five sections each containing two questions; candidates were required to answer four questions, one from each of three sections and one from any of the same three sections. For Options Paper 2, candidates were offered twelve questions in six sections each containing two questions; candidates were required to answer four questions, one from each of three sections and one from any of the same three sections.

Team design projects were marked by two Examiners. Teams were marked as groups. The allocation of bonus or penalty marks is permitted under the Conventions, but, after consideration of the candidates, this was not applied by the examiners this year for any of the candidates. Penalty marks were deducted from one candidate who had submitted this work late following permission from the Proctors to apply the penalty in line with the Conventions.

The Business Plans, submitted in the second year, were marked by an Assessor from the Knowledge Exchange and Impact Team of Research Services and an Assessor appointed to represent the Faculty of Materials, again with teams being marked as a group.

Candidates' work on the two coursework modules was marked by two Assessors. One of the examiners further examined a number of representative scripts from both modules, but felt that no further moderation of marks was necessary.

Reports for each of the industrial visits were assessed by the Industrial Visits Organiser, appointed as an Assessor.

The overall mean mark for Part I was at the low end of the 2(i) band. All MS and MEM general papers and option papers results were considered. After extensive deliberation, and in accord with the Conventions, the examiners scaled paper GP3 by adding 4.5% points, and OP1 by adding 6.5% points to each candidate's overall mark for that paper. The other papers were not scaled. After scaling GP3, OP1 and OP2 were toward the middle of the 2(ii) band, and GP1, GP2 and GP4 toward the bottom of the 2(i) band. All MS and MEM General Paper and Option Paper results were considered by the examiners and it was agreed that the papers were fair.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

The performance of the male and female candidates was as follows:
Written Papers Averages – M 61.47%, F 60.57% (Overall 61.23%)
Coursework Averages – M 70.45%, F 71.67% (Overall 70.78%)

Overall Part I Averages – M 63.73%, F 63.35% (Overall 63.62%)

Insofar as can be judged from the small sample size, the performance of male and female candidates was not significantly different. This statement is based on the standard deviation of the written paper averages, which was $\pm 11.40\%$ points for the male candidates and $\pm 7.94\%$ points for the female candidates. Both male and female groups of candidates performed better in the coursework than in written examinations.

Where approved by the Proctors, candidates were allowed (i) extra time on account of dyslexia / dyspraxia, and/or (ii) other special arrangements. These allowances seemed satisfactory.

mark (%)	Overall mark		Written Examinations		Coursework	
	Male	Female	Male	Female	Male	Female
30-40		-	3	-	-	-
40-50	3	1	-	1	-	-
50-60	2	1	5	2	-	-
60-70	15	7	12	6	14	2
70-80	3	-	3	-	10	7
80-90	1	-	1	-	-	-
Totals	24	9	24	9	24	9

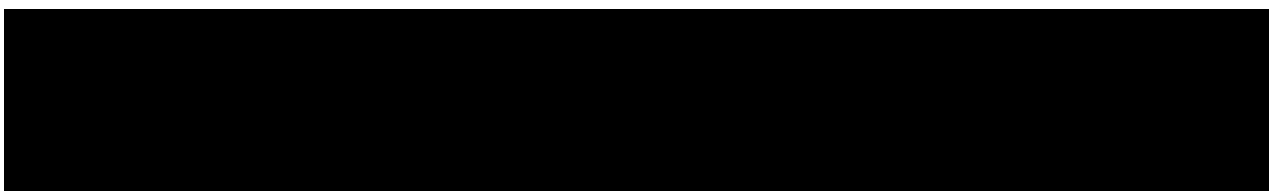
C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination, in that there were no optional written papers.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS



F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. H.E. Assender (Chair)	Prof. S. Lozano-Perez
Prof. T.J. Marrow	Prof. P.D. Nellist
Prof. R.C. Reed	Prof. P.R. Wilshaw
Prof. M.G. Burke (external)	Prof. M.J. Reece (external)

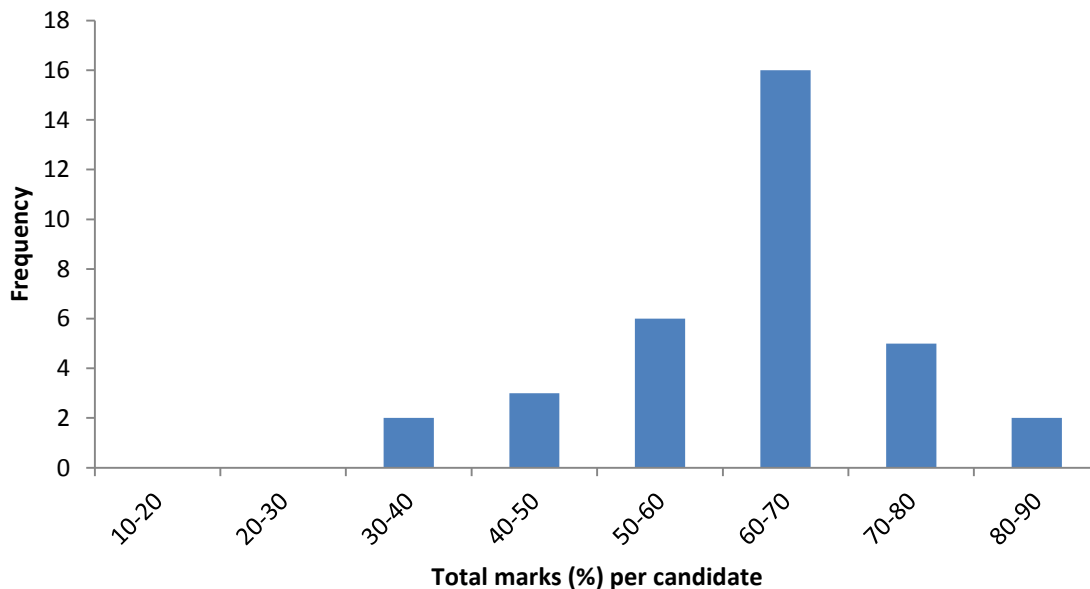
General Paper 1 – Structure and Transformations

Examiner: Professor Sergio Lozano-Perez
Candidates: 34 (33 MS / 1 MEM)
Mean mark: 62.56%
Maximum mark: 87%
Minimum mark: 39%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	13	11.35	14.5	4.5	Phase Transformations
2	22	12.70	18	2	Phase Transformations
3	26	14.21	17.5	9.5	Microstructures of Polymers
4	32	12.70	19.5	3	Corrosion and Protection
5	21	10.93	16.5	6	Corrosion and Protection
6	22	12.18	17.5	5	Diffusion
7	10	15.20	17.5	9	Powder Processing
8	24	10.75	18.5	4.5	Surfaces and Interfaces

**Part I 2016 MS/MEM
General Paper 1**



General Comments

This paper had an average of 62.6%, which was slightly higher than last year's (59.2%). The candidates displayed a good understanding of the topics involved. Two candidates scored above 80 marks and another two scored below 40. Although last year there were more scoring high marks (5), there were also more scoring low ones (4). All questions had an average score above 50% but two of them (3 and 7) had it around 75%.

Questions:

- 9) This question covered binary phase diagrams and phase transformations. Most of the sections had been covered in the lectures and notes. None of the students was able to score above 75% and the average score was 55%. This question was only chosen by 38% of the candidates (2nd less popular choice)
- 10) Question two focused on the processes controlling the rate of nucleation in phase transformations. The students were provided with a diagram taken from the lecture notes and asked to describe the key process, undercooling and phase transformation during growth. Some of the answers on examples where precipitation processes were important in engineering situations were not included in the model answers provided but still considered valid. The average score was 63% and the highest 90%.
- 11) This question from the Polymers course covered topics that were clearly identified in the lecture notes. Candidates were asked to describe major types of intermolecular interactions between polymer chains, explain why polymers can take a helical configuration and describe factors affecting polymer solubility. The answers were adequate on average and contained most of the key pieces of information required although the writing style tended to be disorganized and lacking structure. The average mark was 71% and the highest 87%. This question was chosen by 76% of the candidates (2nd most popular choice).
- 12) The first question on corrosion covered Pourbaix diagrams, which is one of the core topics in the lecture and where the students get plenty of examples and practice. Section a) was a straight forward textbook question, while section b) only required the calculation of the lines composing the diagram provided. Section c) involved some speculation on the consequences of increasing the temperature in the system provided and only a handful of students answered it correctly. Overall, the results were good, with an average mark of 73% and a highest of 97%. This question was chosen by 94% of the candidates (most popular choice).
- 13) The second question on corrosion didn't require any calculations and focused on the understanding of corrosion mechanisms and the preventive measurements required for a series of systems. The students answered well most of the questions although they often lack one of the key diagrams required for an optimum description of the phenomena. The average mark was 54% and the highest 82%.
- 14) This question focused on the understanding of diffusion in different media. Most topics were fully covered in the lectures, with some sections requiring an extra effort. Many students thought H was a faster permeant than He, although their reasoning was correct. Very few produced a correct graph in section c). The average mark was 60% and the highest 87%.
- 15) Question 7 required answers describing manufacturing procedures such as inert gas atomization or metal injection moulding. Most students mentioned the key aspects of each procedure correctly, although their writing skills could have been improved. This question was only chosen by 29% of the candidates (least popular choice). However, it was the question with the highest average score, 76%, with a maximum score of 87%.
- 16) Finally, question 8 covered surfaces and interfaces. In section a) the students were asked to derive the Young-Dupre equation, which is described in the lecture notes. This was done successfully by the majority. However, in section b) they were asked to explain what happens at the extreme cases, and many were confused by the fact that the cosine in the eq couldn't be solved. Section d) was particularly challenging, but 2 students demonstrated a good knowledge of the topic and found the right answer. The average mark was 54% and the highest 92%.

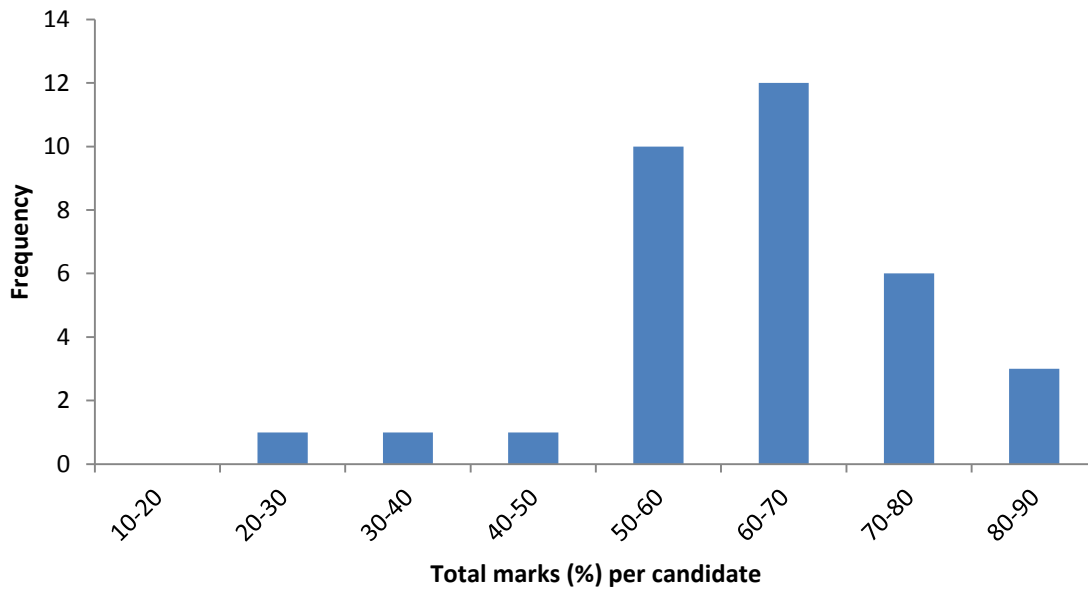
General Paper 2 – Electronic Properties of Materials

Examiner: Professor Peter Wilshaw
Candidates: 34 (33 MS / 1 MEM)
Mean mark: 63.65%
Maximum mark: 89%
Minimum mark: 30%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	30	14.53	19	8	Tensor Properties of Materials
2	28	13.82	19	2.5	Electronic Structure of Materials
3	24	12.08	17	7.5	Electronic Structure of Materials
4	29	13.09	19	7	Magnetic Properties of Materials
5	26	10.60	18	4	Quantum & Statisical Mechanics
6	22	11.02	19	2.5	Quantum & Statisical Mechanics
7	10	11.95	18	6.5	Semiconductor Materials
8	1	18.50	18.5	18.5	Electrical and Optical Properties

**Part I 2016 MS/MEM
General Paper 2**



General Comments

Overall this paper was well answered with most candidates showing either a good or very good understanding of the material covered. Most questions required mainly quantitative answers which resulted in very high marks when done well and close to zero when candidates were unable to obtain a solution. This is reflected in the distribution of marks for the paper with a few low to very low marks and some extremely good scripts. Both the question on Electrical and Optical Properties (Qu. 8) and Semiconductor Materials (Qu. 7) were unpopular but those candidates that attempted them received good marks. Perhaps the message here is that questions that at first sight look difficult can in fact yield good results if attempted.

Questions:

- 1) Tensors. A straightforward question very well answered. Most marks were lost due to incorrect signs.
- 2) Electronic Structure. Generally straightforward question though some candidates were unable to derive the Fermi energy from the density of states function. Many candidates wrote that the Fermi surface was the limit between filled and unfilled states at 0K for *positive* wave vectors. In fact the Fermi surface runs over both positive and negative wave vectors but some credit was still given in view of the way the material is taught in this course.
- 3) Electronic Structure. Kronig-Perry. A reasonably well answered question. The main point missed was that energy as a function of k is multivalued ie $E = \frac{\hbar^2}{4\pi^2} \left(k + \frac{2\pi}{a} n \right)^2$ where n is an integer and it is the different values of n that give rise to the different bands.
- 4) Magnetism. A well answered question. However, a surprising proportion of candidates were unable to give approximate values for susceptibilities and examples of specific materials for particular applications.
- 5) Quantum and Statistical Mechanics. Specific Heats. The book work parts were done well (derivation of states of a SHM oscillator) but the explanation as to why classical mechanisms fail to account for specific heat tending to zero as temperature tends to zero was poorly done. Most candidates were at a loss as to how to evaluate occupation probabilities at low temperatures.
- 6) Quantum and Statistical Mechanics. Operators. A reasonably straightforward question but not answered particularly well. Explanations of zero point energy in a crystal and wave packets were generally poor as was the interpretation of the diagram relating L and m .
- 7) Semiconductor Materials. Generally well answered. Mostly done by candidates who knew the derivation of the ideal diode equation and got good marks for it. Surprisingly many candidates struggled to enter the numeric values correctly in the final part of the question. Better care and calculator skills would have yielded significantly higher marks in many cases.
- 8) Electrical and Optical Properties. An extremely unpopular question, but not especially difficult, very well answered by the person who did it.

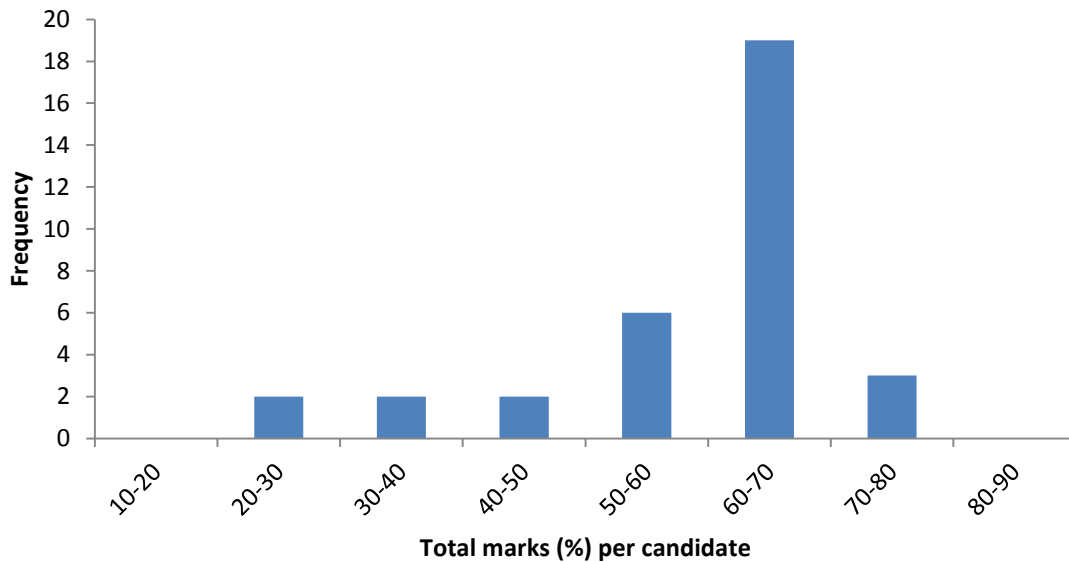
General Paper 3 – Mechanical Properties

Examiner: Professor Hazel Assender
Candidates: 34 (33 MS / 1 MEM)
Mean mark: 59.09%
Maximum mark: 80%
Minimum mark: 26%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	23	10.48	15	3.5	Microplasticity
2	18	8.00	15	0	Macroplasticity
3	26	12.73	19.5	5.5	Microplasticity
4	24	12.13	19	6.5	Mechanical Properties of Polymers
5	19	9.97	15	5	Mechanical Properties of Composites
6	26	11.08	19.5	4.5	Elastic behaviour in isotropic materials
7	13	11.04	18	3	Creep
8	21	8.90	17.5	0	Fracture

**Part I 2016 MS/MEM
General Paper 3**



General Comments

The mean mark for the paper was 59.09% (nearly a percentage point greater than last year) with a peak in the distribution in the 2:1 band, and a long, but low 'tail' into the low marks. Four candidates scored below 40%, including two below 30%, and these account for the very low 'lowest mark' cases in the table. There was a reasonably even distribution of questions answered.

Questions:

- 1) **Microplasticity.** Hall-Petch equation and void defects in Ni-based superalloys. One of the more popular questions. a) Justify form of H-P equation – some candidates showed poor logical progression in the argument they presented or missed key steps to the description. b)i) Interactions of dislocations with voids – confusion with hard inclusions, and sometimes not *explaining* why the effect increases hardness. b)ii) Calculation of increase in tensile yield stress – an encouraging number of candidates could estimate λ and some took account of the void radius, but often the wrong value of angle subtended was used, despite it being in the question.
- 2) **Macroplasticity.** Comparison of yield criteria, applied to torque on a nickel disc. A not-so-popular question with the lowest average mark. a) Coulomb criterion – some discussion of orientation/crystallography, most mentioned hydrostatic stress by often not **why** it's not needed for metals. Again, most mentioned polymers, but often without a reason. b) Torque required for yield in a Ni disc without (ii) and with (iii) a compressive stress – part (i) (which yield criterion) was good in many cases but some considered the stress state, rather than what was given in the question about the material; (ii) candidates demonstrated a good understanding of the problem (arrangement of the stresses) but then could not complete the calculation; (iii) Many candidates could not start this section, attempts were often made using Moore's circle, but did not use the von Mises criterion.
- 3) **Microplasticity.** Stress fields around dislocations and dislocation interactions. One of the most popular two questions, with the highest average mark. a) Expression for force on a dislocation – mostly good. b) RH/FS rule for Burgers vector – mostly good. c) Derivation of expression for glide force on interacting edge dislocations – many candidates got σ wrong and often didn't make use of the expression from part (a). d) Equilibrium points between dislocations on parallel slip planes – (i) many candidates tried to find the max/min force points rather than the $F=0$ points; (ii) most struggled to identify the formation of a low angle grain boundary.
- 4) **Polymers.** Standard linear model of viscoelastic behaviour. A popular question with a high average mark. a) Definition of linear viscoelastic behaviour – well answered, but there was some confusion between viscoelastic and plastic, and the description of metal deformation was poor in some cases. b) Why model viscoelastic behaviour – the answer was often given in terms of yield or plastic behaviour or assumed constant loads in real applications. c) definition of creep and stress relaxation – creep usually OK, but stress relaxation was often thought of only in terms of the relaxation of the component once the stress had been removed. d) Calculation of creep using the standard linear equation (given) – a surprising number of mistakes e.g. in integrating and in poor use of limits to integral. e) Sketch of extension/time curves – generally a good approximation, although sometimes with a very low initial gradient.
- 5) **Composites.** Strength as a function of fibre volume fraction. A lowish average mark. a) nature of failure of matrix and fibre and hence composite as a function of vol. fraction – good explanations for the failure mode of the composite, but many candidates did not first justify the failure modes of the individual components. b) Graph of strength vs volume fraction – this section was a challenge to many candidates. Often the general shape of the graph was OK, but in most cases many of the quantitative aspects were wrong. The assumptions given were very general often not mentioning e.g. fibre pull-out. c) Benefits of composites – often a general discussion, not related to what had been shown in the question.
- 6) **Elastic behaviour in isotropic materials.** One of the most popular two questions, with a strong average mark. Normal strain on a steel disc subject to radial compressive stress. a) Expressions for radial and hoop strains – generally good. b) Disc with radial compressive stress i) show uniformity of strains – this was a challenge as the candidates had not directly seen this before, but there were many good answers. Candidates often considered the $r \rightarrow \infty$ and some confused strain with displacement. ii) Expression for normal stress – some candidates wrote the expression for a radial rather than normal stress. iii) Calculation of change in thickness – a surprising number of candidates could not calculate the change in thickness, even once the strain was known.

- 7) **Creep.** Testing of fatigue life. The least popular question, but it attracted quite a high average mark. a) Stress vs time for different stress ratios – generally good. b) Comparison of S-N curves for Cu and steel – some candidates did not comment on the levelling off of the curve at high cycles for work hardening, considering only the relative stresses. c) Fatigue test methods – many candidates could not clearly explain an experimental method. d) Estimation of high cycle fatigue strength – most did not name the relationship, as asked in the question, and many, did not use the Goodman relation, by recognizing the difference between $R=0$ and $R=-1$.
- 8) **Fracture.** Ductile-brittle transition, and role of tempering in steels. A low average mark for this question. a) Ductile-brittle transition: i) Charpy test – generally good, but some candidates lost marks by not covering all aspects of the question; ii) comparison of Zn and Ti – candidates often had the wrong crystal structure for one metal; iii) effect of grain size – several candidates spent time describing the graph without explaining the behaviour. Several assumed the x-axis of the graph to be grain size, not $(\text{grain size})^{-0.5}$. There were several mentions of crack propagation in relation to ductile failure. b) Tempering: i) mechanism for drop on toughness – generally good; ii) fracture surfaces – often one morphology was too pure-brittle, and some candidates reversed ductile and brittle morphologies; iii) methods to reduce risk of low toughness on tempering – often good, but some very general strategies to increase fracture strength rather than methods related to the effects of tempering.

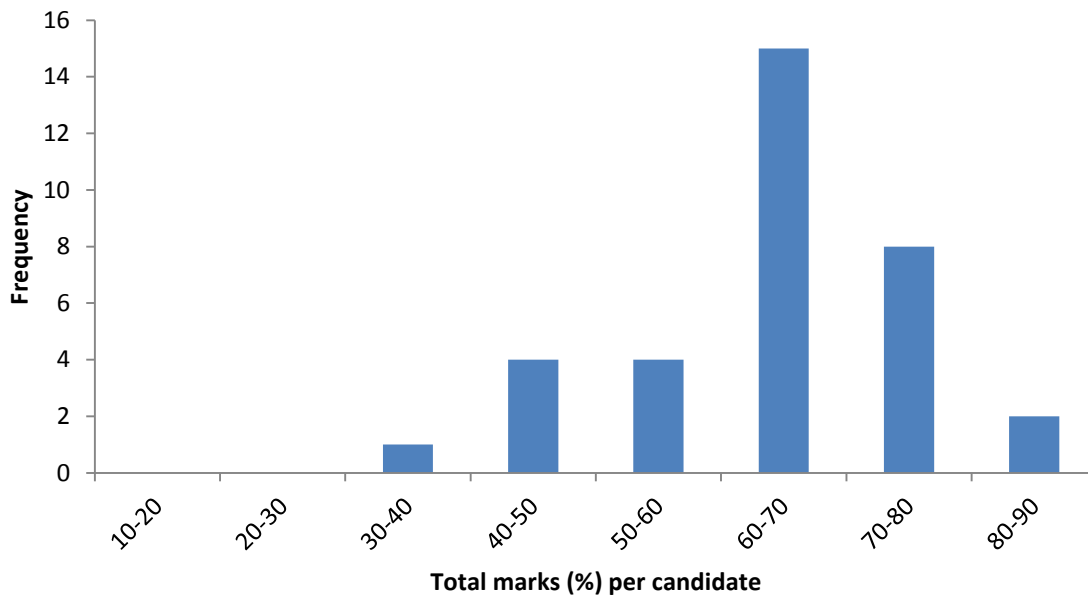
General Paper 4 – Engineering Applications of Materials

Examiner: Professor Roger Reed
Candidates: 34 (33 MS / 1 MEM)
Mean mark: 63.76%
Maximum mark: 82%
Minimum mark: 40%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	18	12.58	16.5	6	Polymers and rubbers
2	14	10.89	17	7	Device materials
3	23	12.46	18.5	4.5	Device materials
4	28	12.82	17.5	6.5	Materials characterisation
5	33	14.35	18.5	5.5	Materials characterisation
6	29	13.38	17.5	9	Ceramics
7	11	10.05	15.5	7.5	Physical metallurgy
8	14	10.82	16.5	6	Physical metallurgy

**Part I 2016 MS/MEM
General Paper 4**



General Comments

The paper proved to be – in the examiners' opinion – a fair one, producing a reasonable spread of marks and thus discriminating between the best, good and less good students. Some questions proved more popular than others with the more quantitative ones being least popular and the lowest average marks. No significant issues emerged.

Questions:

- 1) A fair albeit largely qualitative question which proved a fair discriminator between students. No problems found.
- 2) One of the least popular questions with a rather low average mark. Part (b) in particular was not done well. Feedback has been provided to the lecturer concerned.
- 3) Good question with a reasonable number of students attempting it. Some very poor answers at the tail were observed but otherwise no issues to be emphasised.
- 4) Good question, popular and producing a good spread of marks. No problems found.
- 5) Many students attempted this and most scored well. Possibly this is due to the popularity of this course and its manner of presentation. Nonetheless a good spread of marks. Good question although feedback: due to the course content there is a rather limited number of questions/topics which have arisen from this course in recent years and one could argue for greater variety moving forward. Feedback given to question setter.
- 6) The students scored rather well on this question and this was the most popular question on this paper. The question was rather procedural and of a style and content somewhat consistent with those set in previous years. The quantitative part in particular led to some good scores. Detailed feedback has been offered to the lecturer concerned.
- 7) This question required rather fundamental but important knowledge concerning the basic strengthening mechanisms induced by phase transformations in steels. As such it covered material taught in a number of different courses at Oxford and therefore represented a fair test. It produced the lowest score on this paper and was not particularly popular.

The lowest-scoring question on this paper. The question went beyond the material given to the student in lectures, particularly with part (c) and required a fair degree of critical thinking. This probably explains why this question was not popular.

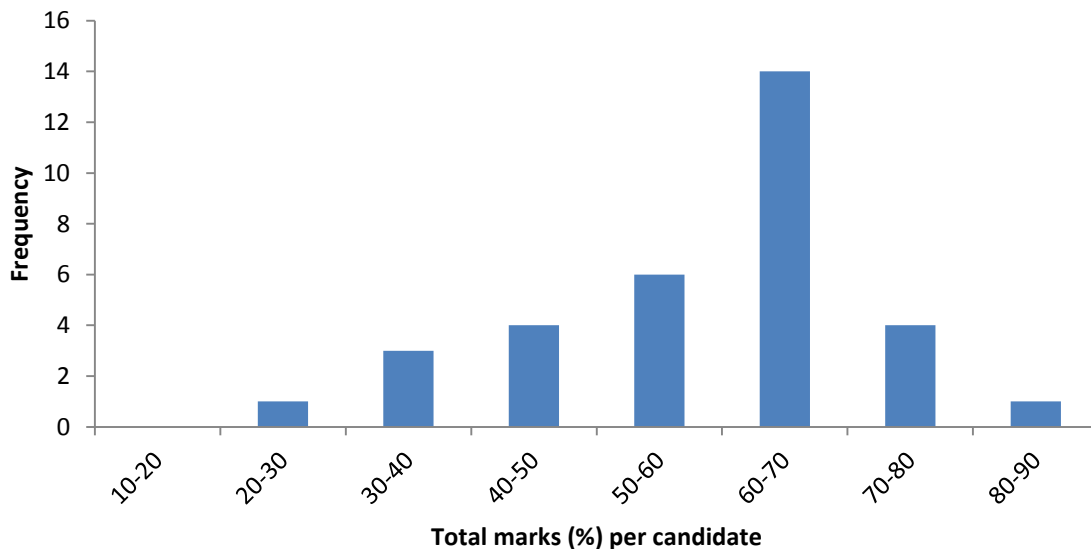
Materials Options Paper 1

Examiner: Professor Pete Nellist
Candidates: 33 (MS)
Mean mark: 58.91%
Maximum mark: 90%
Minimum mark: 28%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	13	10.04	16	1.5	Strength and Failure
2	16	13.66	19.5	8	Strength and Failure
3	3	7.33	15	1	Nanomaterials
4	3	8.83	11.5	5	Nanomaterials
5	14	18.36	23	11.5	Prediction of Materials Properties
6	14	10.50	21.5	5	Prediction of Materials Properties
7	14	13.57	23	0	Optics and Optoelectronics
8	12	13.33	22	3	Optics and Optoelectronics
9	29	12.74	20.5	4.5	Engineering Ceramics
10	13	13.31	23.5	1.5	Engineering Ceramics

**Part I 2016 MS
Option Paper 1 scaled**



General Comments

The paper produced a wide distribution of marks, with an overall mean of 52.4%. While this was slightly higher than the unscaled OP1 mark for 2014-15, in accordance with the Conventions the mark was scaled by the addition of 6.5% to each candidate's mark, to bring the mark in line with the other papers of this year.

Across most of the topics in this paper, the mean marks for the questions were rather consistent. The Nanomaterials questions continue to be unpopular, and were answered rather poorly. The similarity of means for the remaining topics did not suggest a lack of consistency between the difficulty of the questions. Discussion between all examiners concluded that the paper was fair and reasonable in difficulty. It was felt that a weaker tail of candidates had struggled to reach the level expected for these courses, and this tail can be seen in the distribution above.

Questions:

- 1) A Strength and Failure of Materials question on the mechanical properties of steel. A well graded question that required a combination of background knowledge and problem solving. Fairly detailed knowledge was required. It did, for example, require the students to remember part of the Fe-C phase diagram. There were no strong answers to this question and the mean was low compared to the overall mean for the paper..
- 2) A slightly more popular Strength and Failure of Materials question on fatigue fracture. Parts (a) and (b) were standard book-work and the material had been covered directly in the lectures. Part (c) involved a solution to the Paris law to find the exponent in the Basquin equation. The assumptions required were given in the text, but the question tested the candidates' abilities to extend their ideas, and deal with an analytic rather than numerical solution. The question had a mean close to that of the paper. There were both very strong and very weak answers to this question.
- 3) An unpopular Nanomaterials question on the synthesis, properties and characterisation by Raman spectroscopy of carbon nanomaterials. Part (a) was book work about methods to produce carbon nanotubes. The candidates could remember some ideas, but many details were missing. Part (b) involved explaining the chiral vector of carbon nanotubes, and to calculate the diameter. There was substantial variability regarding the extent to which candidates explain and use the chiral vector. Part (c) involved explaining the features of a Raman spectrum and identification of an unknown material. This was weakly answered. The mean for the 3 answers to this question was much lower than the overall mean for the paper.
- 4) An unpopular Nanomaterials question. Part (a) covered production and the charge state of an endohedral fullerene. Part (b) covered the use of high-performance liquid chromatography. Both of these sections were largely book-work. Part (c) covered the use of optical absorption via the Beer-Lambert law, and contained a simple problem to solve. This section did require knowledge from background reading. Even the highest mark for this question was below the overall mean for the paper with candidates showing limited knowledge of any of the topics.
- 5) A Prediction of Materials Properties question on the properties of a phonon-mediated superconductor. Parts (a), (b) and (c) were bookwork. Part (d) involved graph plotting and selection of suitable axes. Part (e) involved some expression manipulation to find numerical answers, leading to a conclusion drawn in part (f). Part (g) was more challenging requiring the candidates to make a deduction based on the conclusions of the earlier part of the question. This question produced the highest mean of any question on the paper, and all sections showed some good answers. Some marks were lost for simple things like suitable scales or units on the graph.
- 6) A Prediction of Materials Properties question on Kramers-Kronig analysis of a complex dielectric function. This question was similar to a poorly answered one in the previous year's paper. The examiner and assessor involved felt that this was an important topic that should be tested again. Although it produced a rather low mean, the highest marks were very strong. Part (a) required book-work knowledge about the complex dielectric function. Part (b) required the solving of the Kramers-Kronig integral. The most common error here was incorrect substitution of the dielectric

function in the integral, which should be straightforward. In final formatting, the equality in the suggested substitution had been turned into an inequality. In most cases, the candidates had assumed an equality. In the few cases where they had used the expression as written, the examiners compensated the marks. Part (c) required generating plots and values at limits. Part (d) was unusual, relating the dielectric function to absorption, but the good candidates coped well with it. Part (e) was more challenging, but several candidates gave a good explanation.

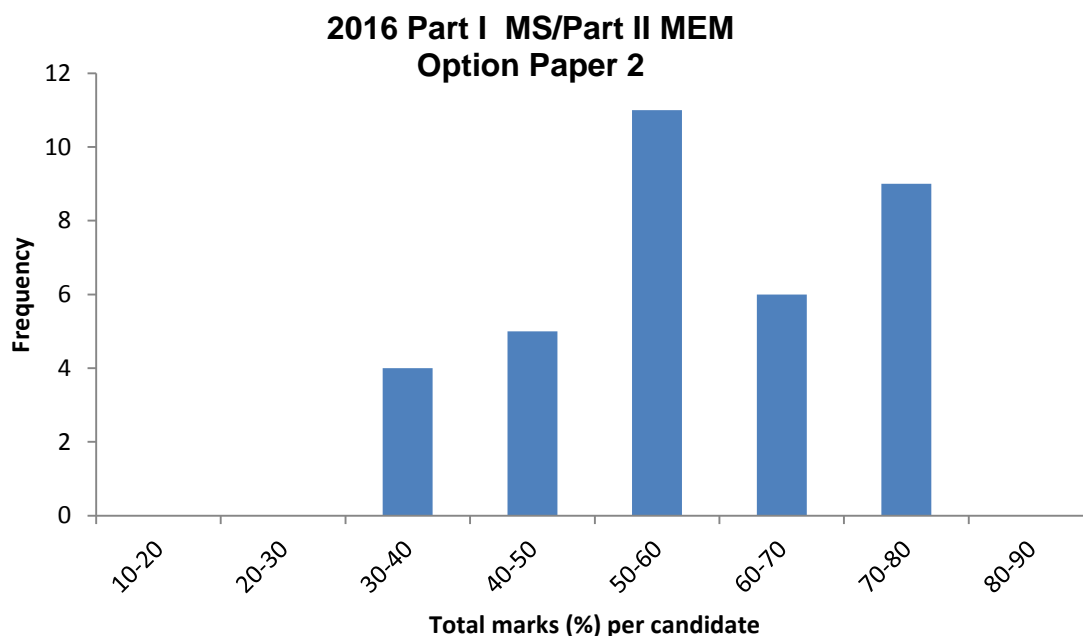
- 7) An Optics and Optoelectronics question optical devices and metamaterials. This was mainly a descriptive question with the topics covered in the lectures and notes, but good answers required a good understanding of the underlying science. The mean for the question was in-line with the overall mean for the paper, but with a huge range of marks both high and low.
- 8) An Optics and Optoelectronics question optical excitations in semiconductors. Part (a) was book-work on excitons. Part (b) was a straightforward calculation of an exciton energy. Part (c) required an explanation of absorption data in terms of the bandstructure. Part (d) required the suggestion of a design for a solar cell using the ideas from earlier in the question. The mean for the question was in-line with the overall mean for the paper, but with a huge range of marks both high and low.
- 9) An extremely popular Engineering Ceramics question. Parts (a) and (b) were book-work about transformation toughening. Part (c) required the analysis of a Weibull plot. While most candidates were able to use a Weibull plot, many forgot that the data given was for a sample that had already been proof tested. A linear extrapolation was required, but omitted by many candidates. In some cases, it was not clear whether the extrapolation had been done, and the benefit of the doubt applied. The mean for this question was a little below the paper average, but with a wide range of marks achieved.
- 10) An Engineering Ceramics question on reaction bonded silicon nitride (RBSN). Part (a), on the production of RBSN was book-work. Part (b) required a derivation, which was well understood by many candidates. Part (c) required the details of the reaction, which many were able to do. Part (d) was book-work comparing ceramics. The mean for the question was in-line with the overall mean for the paper, but with a huge range of marks both high and low. The highest question mark on the entire paper was achieved on this question.

Materials Options Paper 2

Examiner: Professor James Marrow
Candidates: 35 (33 MS / 3 MEM)
Mean mark: 59.34%
Maximum mark: 80%
Minimum mark: 33%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	19	16.37	22	4.5	Advanced Polymers
2	17	13.35	18.5	7.5	Advanced Polymers
3	8	13.75	20	4	Manufacture with Metals and Alloys
4	7	14.07	19.5	6	Manufacture with Metals and Alloys
5	10	13.50	18	10.5	Materials for energy prod ⁿ , distrib ⁿ & storage
6	13	15.08	20	8	Materials for energy prod ⁿ , distrib ⁿ & storage
7	8	12.56	19.5	2.5	Advanced Engineering Alloys and Composites
8	2	14.50	16.5	12.5	Advanced Engineering Alloys and Composites
9	17	16.79	24	2	Biomaterials and natural materials
10	17	15.12	22	5	Biomaterials and natural materials
11	16	12.66	21	1.5	Devices
12	6	16.17	21	12.5	Devices



General Comments

The mean mark was 59.4%, but the marks are spread over a good range with nine candidates obtaining first class marks above 70%. Four candidates failed to obtain above 40%.

Questions:

- 1) Most candidates did not provide sufficiently detailed descriptions of the molecular arrangements in a long chain molecule, omitting reference to random walk and entanglement in the case of long chains in particular. Descriptions of the molecular motions of a non-crystallising linear long chain molecule from fully glassy to fully liquid were generally good, though many did not discuss the behaviour of side-groups nor describe how chain movements occurred and many emphasised the timescales of reptation processes rather than molecular motions in general (including non-entangled systems). Explanations of capillary wave formation were generally good, though the role of thermally excited chain motions needed to be emphasised. Examples of polymer thin film applications and methods for manufacture of thin films were good, though many included spin-coating, which is not an industrial process. Discussions on the effects of thin substrates were less consistently good, most answers focused on capillary wave behaviour but needed to provide more information on how the substrate affected the wavelength. Discussions on orientation were limited in details, needing information on molecular size relative to film thickness for instance. Similarly, the discussions on chemical and physical interactions were insufficiently detailed, and needed more information on wetting and adhesion; the behaviour of multi-phase polymers could also have been discussed.
- 2) Greater clarity of explanation needed on how the polymer structure affects entropy and enthalpy of mixing, which would then have aided the discussion on the LCST. The section on QENS by EWS and EISF was poorly done; none described the actual analysis and few gave correct information on what aspects of the polymer structure and motion were characterised by these measurements. The quadratic relation of linewidth with Q for Fickian diffusion was not always well remembered, but was necessary for accurate plotting to determine the diffusion coefficient, and while most understood the reason for a difference in the relation for random walk diffusion, few properly described the non-linear dependence of linewidth on Q squared. Not all understood the difference between the documentation of the life cycle in a LCA, and quantification of life cycle, particularly the interdependencies between factors that need to be considered in the quantification of the life-cycle. Reasons for end of life were generally well provided and described.
- 3) A good question which separated well the better and less good students, despite being mostly qualitative. Part (c) was not generally done well, but the other parts were involving a significant degree of bookwork.
- 4) This question was reasonably well answered by students. It was fair but also reasonably discerning. Most students made a good effort at the first (quantitative) part but stumbled when dealing with (c) and (d) which required more critical thinking.
- 5) This was an essentially qualitative question. It produced a reasonable spread of marks and thus separated the students well into the different classes. However, the average mark was low thus indicating that this question was not well dealt with. Many students produced excessively long answers recapitulating lecture notes without addressing the details of the question asked which was disappointing.
- 6) A number of answers were let down by inaccurate diagrams of the fuel cell and the arrangement of its components, also omitting the catalytic role of the platinum electrode. Details on the physical mechanism in the fuel cell were missing from some answers, and not all identified the outputs of electricity, water and heat. The comparisons with fossil fuels were often shallow, and did not consider all important aspects such as cost, efficiency and storage in sufficient detail. Descriptions of the electrical transformer were generally good, though not all diagrams were accurate not labelled well. Factors that affected efficiency were not always provided. Fracking descriptions were usually accurate, with some misunderstandings of the process, but the discussions on advantages and disadvantages were insufficiently detailed (e.g. Access to previously uneconomic reserves and use of water resources). Most descriptions of the Rankine cycle were correct, but more information on the thermodynamics (beyond information on pressure and temperature) was needed. Daniell cells were generally well described with well annotated diagrams. Not all identified the modern day technique of electrochemical capacitors that is based on the same basic principles.

- 7) This was a qualitative question asking the students to compare the choice of existing and emerging materials for three different aerospace applications. The questions were challenging and separated well the better students from the worst. The mean score was however the lowest on this paper, indicating that the students found this hard.
- 8) This question was attempted by just two students, who scored 12.5 and 16.5 out of 20. No meaningful conclusions can be drawn, given this low number. The lack of popularity probably stemmed from the proof needed; the evidence suggests that the students preferred the more qualitative questions on this paper.
- 9) Generally full answers provided by all on the structure, function and applications of protein, polysaccharides and phospholipids. The majority used an appropriate method of considering moments to obtain the force on ligament, though unit errors were made by some, and not all considered whether their answer was realistic. Most discussions on the synthetic ligament materials focused entirely on mechanical properties and did not consider aspects such as resorption, availability as fibrous materials and immune response. Discussions on polymers in THR were generally correct, but more detail could have been provided on the degradation and its causes, and selection of alternatives.
- 10) The majority correctly described cancellous and cortical bone, giving their structure and identifying where these occur. Most descriptions of structural hierarchy were correct, though some lacked sufficient detail (simply listing parts of the structure) and very few explained how such structures arise. The T-score was correctly described by most, though not all understood it was measured in units of standard deviation. Explanations of the curve shape were mostly sufficiently detailed (some were purely descriptive), and while many recognised the effects of lifestyle/gender on bone density, fewer considered the effects of sample location and orientation in the bone. Descriptions of Wulff's law were mostly correct, and the majority were able to derive the relation between modulus and density, though not all solutions were sufficiently clear for full marks to be awarded.
- 11) This was a good question which produced both very good and very poor answers with a fair spread in between. The mark was however low indicating that the students found it hard – part (b) in particular was not done well. No major problems.
- 12) This question was chosen by only 6 students but each of them scored well with the minimum mark 50%. A good question although possibly in retrospect too many sections and sub-sections which aided in the students scoring well.

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS SCIENCE, PART II EXAMINATION

Part I

A. STATISTICS

(1) Numbers and percentages in each category

Candidates are given a mark on the basis of their performance in the Part II examination and then given a classification on the basis of their performance across Part I and Part II.

Class	Number			Percentage (%)		
	2015/16	2014/15	2013/14	2015/16	2014/15	2013/14
I	8	9	8	34.7	36.0	36.4
II.I	11	13	8	47.8	52.0	36.4
II.II	3	3	5	13.0	12.0	22.7
III	0	0	1	0.0	0	4.6
Pass	1	0	0	4.3	0	0
Fail	0	0	0	0.0	0	0
Total	23	25	22	-	-	-

(2) The use of vivas

The Part II examination in Materials Science consists only of a research project, for which a thesis not exceeding 12,000 words, or 100 pages, is produced. The mark for the Part II is for the thesis alone. All candidates were given a viva solely to clarify points of detail and to ensure that the thesis presented had been prepared by the candidate being examined. The discussion in the vivas was led by the internal Examiners or Assessors who had read the thesis fully but the other examiners, including an external examiner, also had the opportunity to ask questions.

(3) Marking of theses

All theses were double blind marked by two internal Examiners or Assessors, and were inspected by one external. Due to the small number of candidates, which makes it easy to identify who is working on a particular research topic, anonymous marking is not possible. Provisional marks were exchanged in advance of the viva, to allow a brief discussion of differences of assessment, which if necessary could be explored further during the viva. Following the viva, a final agreed mark was decided between all the examiners. The two internal Examiners/Assessors who read the thesis provided the greatest input to the decision making process.

B. NEW EXAMINING METHODS AND PROCEDURES

New procedures for dealing with mitigating circumstances, such as illness to a candidate, were introduced across the University as described in Part 13 of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations 2014. This change was captured in the Examination Conventions distributed to candidates.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

The new procedures for dealing with 'Factors Affecting Performance' (FAPs) should be reconsidered. Last year's examiners reported:

1. Mechanisms for ensuring consistency in responding to FAPs from year to year and between Examination Boards need to be established. Devolving decision making to the individual Examination Boards is likely to generate inconsistency in how mitigating circumstances are treated, which may in turn risk the University's reputation for fairness. A more centralised process at Divisional or University level would help achieve a consistent approach and be more in line with other institutions.
2. The wealth of experience in dealing with mitigating circumstances accumulated over many years within the Proctors Office is not available within the individual Examination Boards. Serious consideration should be given to returning FAPs to the Proctors Office and if necessary increasing the resource available there.

This year's examiners (five out of six of whom differ from last year) endorse these points. We recognise that the Examiners are best placed to assess how marks may be adjusted given a case, but only once a case has gone through the Proctors office to assess the validity and impact and to conduct any further enquiries.

A consequence of the new FAP process is that it places the burden on the student to ensure the provision of all material that can be considered, including in getting other bodies (college, doctor etc.) to submit information on their behalf at a time when they are likely coping with the effects of illness or particular difficult circumstances that affect their performance to be able to do such things. This contrasts with the previous system in which further clarification or evidence could be sought if necessary. This would appear to be an unacceptable deterioration in fairness to the students.

In addition to the FAPs related to this year's Part II candidates, the examiners considered the FAP applications related to candidates who sat Part I in 2014/15 (and in one case documentation related to a candidate who sat Part I in 2013/14), and whose FAP decisions were carried forward to this year. Final decisions, first on the level of impact, and then on any marks adjustment to be applied, were made in all cases except one (see section part II E).

Two candidates were granted, by the proctors, extensions to the deadline for submission of the Part II thesis. In one of these cases the proctors granted an extension beyond the limit allowed without consulting with the chair in advance. The process by which impact of circumstances which would allow a delay of submission of coursework is judged (by the proctors' office) is in stark contrast to the decisions on impact that must be decided by the FAP panel. For one assessment of impact (to delay submission of coursework) the decision is made by proctors, and for another (where marks may be moderated) the decision on level of impact is made by a FAP panel. This is an undesirable inconsistency. The Materials FHS examiners are of the opinion that all judgements of impact should be made by a specialist panel across all FHSs with the ability to seek further information where necessary, and then judgement of any modification of marks could be made by the particular subject FHS examiners.

D. EXAMINATION CONVENTIONS

The current year's Conventions (2016, attached) were put on the Departmental website and sent electronically to all candidates on 08 March 2016. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

Of the 22 candidates who results were ratified by the examiners 21 were awarded Honours and 1 candidate was awarded a BA with Honours (unclassified). The examination required the candidates to submit a thesis (maximum 12,000 words) on a research project carried out by candidates during the year, usually in the Department of Materials. Candidates were given a 25 minute viva, during which they were asked detailed questions on their thesis and research work.

The theses were generally of a high quality, and most candidates were able to explain their work well in the vivas. The marks for the Part II examination ranged from 35% to 82%, with an overall mean mark towards the top of the 2(i) range. The external Examiners played an important role in deciding the final marks for the candidates and the Chair would like to express her thanks to both of them for their hard work in inspecting so many Part II theses and contributing greatly to the vivas.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

Insofar as can be judged from the small sample size, the performance of male and female candidates was not significantly different.

However there were no applications for consideration for specific learning difficulties made for the Part II component of the exam process this year (other than one candidate whose FAP application included reference to this), despite a number of the same candidates having been identified as having such conditions when sitting their Part I.

mark (%)	Overall mark		Part 2 Project		Part I Mark	
	Male	Female	Male	Female	Male	Female
30-40	-	-	1	-	-	-
40-50	1	-	-	-	-	-
50-60	2	2	2	1	5*	3
60-70	10	2	7	2	8	1
70-80	3	3	5	4	2	3
80-90	-	-	1	-	1	-
Totals	16	7	16	7	16	7

*See section E for commentary regarding one candidate.

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same examination, producing a thesis and attending a viva. The statistics on the final marks for both Part I (2015) and Part II for these candidates are given above.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Not relevant for this examination.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

[REDACTED]

[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. H.E. Assender (Chair)	Prof. S. Lozano-Perez
Prof. T.J. Marrow	Prof. P.D. Nellist
Prof. R.C. Reed	Prof. P.R. Wilshaw
Prof. M.G. Burke (external)	Prof. M.J. Reece (external)

Examination Conventions 2015/16

Materials Science - Final Honours School

1. INTRODUCTION

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These Conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. Normally the relevant Regulations and Course Handbook are the editions published in the year in which the candidate embarked on the FHS programme.

The attention of candidates for Part I of the Examination is drawn to key phrases in clauses 5 and 7 of Section A and clause 3 under Part I of Section B of the Special Regulations for the Honour School of Materials Science:

Section A. 5. No candidate may present him or herself for examination in Part II unless he or she has been adjudged worthy of Honours by the Examiners in Part I.

Section A. 7. To achieve Honours at Part I normally a candidate must fulfil all of the requirements under (a), (b) & (c) of this clause. (a) Obtain a minimum mark of 40% averaged over all elements of assessment for the Part I Examination, (b) obtain a minimum mark of 40% in each of at least four of the six written papers sat in Trinity Term of the year of Part I of the Second Public Examination, and (c) satisfy the coursework requirements set out in Section B, Part I [of the Regulations].

Section B. Part I. 3. In the assessment of the Materials coursework, the Examiners shall take into consideration the requirement for a candidate to complete satisfactorily the coursework to a level prescribed from time to time by the Faculty of Materials and published in the Course Handbook. Normally, failure to complete satisfactorily all five elements of Materials Coursework will constitute failure of Part I of the Second Public Examination.

The examiners are nominated by the Nominating Committee* in the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners are independent of the Department and of those who lecture courses. However, for written papers on Materials Science in Part I examiners are expected to consult with course lecturers in the process of setting questions. The paragraphs below indicate the conventions to which the examiners usually adhere, subject to the guidance of the appointed external examiners, and other bodies such as the Academic Committee in the Department, the Mathematical, Physical and Life Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners.

The Materials Science Examiners in Trinity 2016 are: Prof. Hazel Assender (Chair), Prof. James Marrow, Prof. Pete Nellist, Prof. Sergio Lozano-Perez, Prof. Peter Wilshaw and Prof. Roger Reed. The external examiners are Prof. Grace Burke, University of Manchester, and Prof. Mike Reece, Queen Mary, University of London.

It must be stressed that to preserve the independence of the examiners, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via the candidate's college, who will, if the matter is deemed of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Examiners.

If there are believed to be mitigating circumstances, such as illness, which may have affected the candidate's progress with coursework or performance in a written exam these should be drawn to the attention of the candidate's college as soon as practicable. Candidates should complete the form entitled 'Factors affecting performance in examinations' and submit this to the college with appropriate supporting material. The Senior Tutor of the college will submit the application to the Registrar for forwarding to the Chairman of Examiners for consideration according to Part 13 of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations 2015/16.

During the marking process the scripts of all *written papers* remain anonymous to the markers. [In some of the descriptions of marking for individual elements of *coursework* that are given later in this document the term 'double marked, blind,' is used; this refers to the fact that the second marker does not see the marks awarded by the first marker until he or she has recorded his or her own assessment, and does not indicate that the candidate is anonymous to the markers.]

* for the 2015-16 examinations the Nominating Committee comprised Prof Grovenor & Dr Taylor.

Procedures covering late submission of or failure to submit/deliver one or more elements of coursework to the Examiners

The Examination Regulations stipulate specific dates for submission of the required elements of coursework to the Examiners (1. One piece of Engineering & Society Coursework; 2. A set of twelve reports of practical work as specified in the Course Handbook (normally each individual report within the set has been marked already as the laboratory course progresses); 3. A Team Design Project Report and associated oral presentation; 4. A set of four Industrial Visit Reports as specified in the course handbook; 5. A report on the work carried out in either the Characterisation of Materials module or the Introduction to Modelling in Materials module; and 6. A Part II Thesis). Rules governing late submission of these six elements of coursework and any consequent penalties are set out in the 'Late submission and non-submission of a thesis or other written exercise' clause of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (Part 14, 'Late Submission, Non-submission, Non-appearance and Withdrawal from Examinations' in the 2015/16 Regulations).

Under the provisions permitted by the regulation, late submission of an element of coursework, as defined above, for Materials Science examinations will normally result in one of the following:

- (a) With permission from the Proctors under para 14.7 no penalty.
- (b) With permission from the Proctors under paras 14.9 and 14.10, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work, and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Examiners with due consideration given to the circumstances and to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners". The reduction may not take the mark below 40%.
- (c) Where the candidate is not permitted by the Proctors to remain in the examination, he or she will be deemed to have failed the examination as a whole.
- (d) Where, without the permission of the Proctors under paras 14.9 and 14.10, work is proffered so late that it would be impractical to accept it for assessment a mark of zero shall be recorded and, as per the Special Regulations for the Honour School of Material Science, normally the candidate will have failed Part I or II as appropriate of the Examination as a whole.
- (e) Where no work is submitted a mark of zero shall be recorded and, as per the Special Regulations for the Honour School of Material Science, normally the candidate will have failed Part I or II as appropriate of the Examination as a whole.

Where an element of coursework is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case *for the element of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires a minimum mark of 40% if the candidate is not to fail the examination as a whole.

Elements of coursework comprising more than one individual piece of assessed coursework

Penalties for late submission of individual practical reports are set out in the 2014/15 MS/MEM FHS Handbook and are **separate** to the provisions described above.

The consequences of failure to submit individual practical reports or failure to submit/deliver other individual pieces of assessed coursework that contribute to one of the *elements* of coursework scheduled in the Special Regulations for the Honour School of Material Science are set out in the MS/MEM FHS Handbook (sections 7 and 10.8 of the 2014/15 version) and are **separate** to the provisions described above. In short normally this will be deemed to be a failure to complete satisfactorily the relevant element of Materials Coursework and will therefore constitute failure of Part I of the Second Public Examination.

Where an individual practical report or other individual piece of assessed coursework that contributes to one of the *elements* of coursework scheduled in the Special Regulations for the Honour School of Material Science is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case *for the individual piece of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires submission/delivery of every individual piece of assessed coursework if the candidate is not to fail the examination as a whole.

For elements of coursework with a defined word limit: if a candidate exceeds this word limit without permission normally the examiners will apply a penalty of 10% of the maximum mark available for the piece of work. [It is only possible to apply for permission to exceed a word limit if the Examination Regulations for the specific element of coursework concerned state explicitly that such an application is permitted, excepting that the Proctors may, exceptionally, under their general authority grant such permission.]

2. PART I

(1) *Setting of papers*

Part I General Papers 1 – 4 are set by the examiners in consultation with course lecturers. The responsibility for the setting of each examination paper is assigned to an examiner, and a second examiner is assigned as a checker. Option papers are set by lecturers of the option courses and two examiners, the examiners acting as checkers. The examiners, in consultation with lecturers, produce model answers for every question set. The wording and content of all examination questions set, and the model answers, are scrutinised by all examiners, including, in particular, the external examiners.

(2) *Paper Format*

All General papers comprise eight questions from which candidates attempt five. Each question is worth 20 marks. The total number of marks available on each general paper is 100. Materials Option papers comprise one section for each twelve-hour Options lecture course, each section containing two questions: candidates are required to answer one question from each of any three sections and a fourth question drawn from any one of the same three sections. The total number of marks available on each option paper is 100, and all questions carry equal marks. Questions are often divided into parts, with the marks for each part indicated on the question paper. Marking criteria are given in section 4.

(3) *Marking of papers*

All scripts are double marked, blind, by the setter and the checker each awarding an integer mark for each question. After individual marking the two examiners meet to agree marks question by question. If the differences in marks are small (~10% of the total available for the question, 2-3 marks for most questions), the two marks are averaged, with no rounding applied. Otherwise the examiners identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the examiners still cannot agree, they seek the help of the Chairman, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this. Options papers are marked by course lecturers acting as assessors and an examiner acting as a checker. The external examiners provide an independent check on the whole process of setting and marking.

The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on their cover sheet which questions, up to the prescribed number, they are submitting for marking. If the cover slip is not completed then the examiners will mark the questions in numerical order by question number. If the candidate lists more than the prescribed number of questions then questions will be marked in the order listed until the prescribed number has been reached. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2(2) above will be awarded and (iii) the mark for the paper will still be calculated out of 100. In addition, for the Materials Options Papers, as per the rubric, the examiners will mark questions from only three sections. Should a candidate attempt questions from more than three sections the examiners will mark those questions from the first three sections in the order listed by the candidate on the cover slip. If the cover slip is not completed then the examiners will mark the sections in alphabetical order by section delineator (section A, section B, etc).

As the total number of students is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiners to adjust all marks for those papers. Such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

- a. Papers with a *mean taken over all candidates* of less than 55% or more than 75% are normally adjusted to bring the *mean* respectively up to 55% or down to 75%. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the paper.
- b. For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (a) above, the questions and typical answers are compared in order to ascertain, with the help of the external examiners, whether the marks are a fair reflection of the

performance of the candidates as measured against the class descriptors. If not, the marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the question or for the paper.

- c. The mean mark and the distribution of marks, both taken over all written papers, are considered, again with the help of the external examiners, in order to ascertain whether these overall marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the overall marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's overall score.

(4) *Marking of Second Year Practicals for Part I*

Second year practicals are assessed continually by senior demonstrators in the teaching laboratory and in total are allocated 60 marks. Part I examiners have the authority to set a practical examination. Penalties for late submission of an individual practical report are prescribed in the Course Handbook and are applied prior to any additional penalties incurred under the provision of section 1 of the present Conventions.

(5) *Marking Industrial Visits*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visits Academic Organiser on a good / satisfactory / non-satisfactory basis, and are allocated a total of 20 marks. Guidance on the requirements for the reports is provided at the annual 'Introduction to Industrial Visits' talk. Formative feedback is provided on the first of the four reports.

(6) *Marking Engineering and Society Essays*

The business plan for "Entrepreneurship and new ventures" is double marked, blind, by two assessors appointed by the Faculty of Materials. The written business plan is allocated a total of 20 marks. Guidance on the requirements for the written business plan and an outline marking scheme are published in the FHS Course Handbook. Further guidance is provided at the 'Building a Business' tutorials, the slides from which are published on WebLearn.

If the Foreign Language Option or a Supplementary Subject has been offered instead of the Business Plan, the reported % mark, which is arrived at in accordance with the CVCP degree class boundary descriptors, is divided by five to give a mark out of 20.

(7) *Marking the Team Design Project*

The team design project is double marked, blind, by two of the Part I Examiners. They then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each project and each team member. Supervisors of the projects submit a written report to the examiners on the work carried out by their teams and these are taken into consideration when the examiners decide the final agreed marks. Industrial representatives may be asked to contribute to the assessment process. The project is allocated 50 marks, of which 25 are for the written report and 25 for the oral presentation. The same two examiners assess both the reports and the presentations. Guidance on the requirements for the report and an outline marking scheme are provided in the 'Team Design Projects Briefing Note' published on the Teaching pages of the Oxford Materials website.

(8) *Marking the Characterisation of Materials and the Introduction to Materials Modelling modules*

The reports for these modules are double marked, blind, by the module assessors. Normally, at least one of the two assessors for each report will be a module organizer. The assessors then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. The Chairman of Examiners oversees this process, sampling reports to ensure consistency between the different pairs of assessors and the two modules. The lead organizer for the Characterisation Module submits to the Assessors and Examiners of the module a short report which provides, by sample set only, (i) a summary of the availability of appropriate characterization instruments during the two-week module and (ii) any other pertinent information. An analogous report is provided by the lead organizer for the Modelling Module in respect of the software & hardware required for each mini-project. The Report for the Characterisation module is allocated 50 marks and each of the two reports for the Modelling module are allocated 25 marks. For each module, guidance on the requirements for the reports and an outline marking scheme are published on WebLearn.

3. PART II

The Part II project is assessed by means of a thesis which is submitted to the Examiners, who will also take into account a written report from the candidate's supervisor. The marking criteria are published in the Part II Course Handbook.

The Supervisor's report is divided into Parts A & B: Part A provides simple factual information that is of significance to the examiners, such as availability of equipment, and is seen by the two markers before they read and assess the thesis. Part A does **not** include personal mitigating circumstances which, subject to guidance from the Proctors, normally are considered only in discussion with **all** Part II examiners thus ensuring equitable treatment of all candidates with mitigating circumstances. Part B of the supervisor's report provides her/his opinion of the candidate's engagement with the project and covers matters such as initiative and independence; it is not seen by the examiners until the discussion held after the viva.

The project is allocated 400 marks, which is one third of the total marks for Parts I and II. Two Part II examiners read the thesis, including the project management chapter, together with Part A of the supervisor's report, and each of them independently allocates a provisional mark based on the guidelines* published in the course handbook. In addition, normally the thesis will be seen by one of the two external examiners.

A *viva voce* examination is held: the purpose of the viva is to clarify any points the readers believe should be explored, and to ascertain the extent to which the work reported is the candidate's. An examiners' discussion is held after the viva, involving all Part II examiners, excepting any who have supervised the candidate's Part II project or are their college tutor. During this discussion Part B of the supervisor's report is taken into account. The outcome of the discussion is an agreed mark for the project. In arriving at the agreed mark the Examiners will take into account all of the following, (i) the comments and provisional marks of the original markers, (ii) the candidate's understanding of their work as demonstrated during the viva and (iii) the opinion of the external examiner who has seen the thesis. It is stressed that it is the scientific content of the project and the candidate's understanding of their work that is being considered in the viva.

If the two provisional marks allocated in advance of the viva differ significantly (that is, normally by more than 10% of the maximum available for a Part II project) this will be addressed explicitly during the discussion after the viva. In the majority of other cases the viva has only a small influence on the agreed mark awarded to a Part II thesis.

If there are believed to be mitigating circumstances, such as illness, which may have affected the candidate's progress with the project these should, in the normal way, be drawn to the attention of the Senior Tutor at the candidate's college, who will, if appropriate, inform the Proctors. The Proctors may in turn communicate with the Chairman of Examiners about the mitigating circumstances. Subject to guidance from the Proctors, if appropriate the Board of Examiners will take into account these mitigating circumstances in their discussion after the viva.

* These guidelines may change and candidates are notified of any such changes before the end of Hilary Term of their 4th year.

4. CLASSIFICATION & MARKING CRITERIA

The following boundaries (CVCP) and descriptors (MPLSD) are used as guidelines:

Class I Honours 70 – 100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
Class Ii Honours 60 – 69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
Class Iiii Honours 50 – 59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
Class III Honours 40 - 49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
Pass	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality

30 - 39 answers, but there will be indications of some competence.

Fail The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary only.

0 - 29

In borderline cases the examiners use their discretion and consider the overall quality of the work the candidate has presented for examination. The external examiners often play a key role in such cases.

Part I:

Unclassified Honours – The examiners are required to classify each candidate according to her/his overall average mark in Part I as (a) worthy of Honours, (b) Pass or (c) Fail. A candidate is allowed to proceed to Part II only if he/she has been adjudged worthy of honours by the examiners in Part I. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks. Candidates adjudged worthy of honours normally proceed to Part II but they may, if they wish and subject to approval from the relevant bodies, leave after Part I in which case an Unclassified Honours B.A. degree will be awarded.

Pass – The examiners consider that the candidate is not worthy of honours and therefore will not be allowed to proceed to Part II. The candidate may leave with a B.A. (without honours) or may retake Part I the following year (subject to college approval).

Fail – The examiners consider that the candidate is not worthy of a B.A. The candidate either leaves without a degree or may retake Part I the following year (subject to college approval).

Part II:

Classified Honours – Once marking is completed for both Parts I and II an overall percentage mark is computed for each candidate and classification then takes place. Subject to the requirement that Part II be adjudged worthy of honours (see below), classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is only taken into account in borderline cases. However, a candidate cannot be awarded an M.Eng. degree unless his/her performance in Part II is adjudged worthy of honours i.e. a candidate must be adjudged worthy of honours both in Part I and in Part II to be awarded the M.Eng. degree. Failure to achieve honours in Part II will result in the candidate leaving with an unclassified B.A. (Hons) irrespective of the aggregate mark.

Pass – Notwithstanding the award of unclassified honours in Part I, the examiners consider that the candidate's overall performance is not worthy of an M.Eng. The candidate is listed as a Pass on the class list and is awarded an unclassified B.A. (Hons) on the basis of Part I performance.

Fail – The examiners consider that the candidate's overall performance is not worthy of an M.Eng. *and* that the performance in Part II is not worthy of a Pass. The candidate is excluded from the class list but is nevertheless awarded an unclassified B.A. (Hons) on the basis of Part I performance.

- The examiners cannot award unclassified honours on the basis of Part II performance unless permitted to do so by the Proctors.
- Nevertheless, candidates awarded a Pass or a Fail by the Part II examiners leave with an unclassified B.A. (Hons) because they were judged worthy of that in Part I (i.e. their degree is the same as if they had left immediately after Part I).
- In terms of the degree awarded, there is no difference between a Pass and a Fail in Part II. The only difference is whether or not the name appears on the class list.
- Candidates cannot normally retake Part II because the Examination Regulations require that they must pass Part II within one year of passing Part I. This rule can be waived only in exceptional circumstances, with permission from the Education Committee.

Annex: Summary of marks to be awarded for different components of the MS Final Examination in 2016 (For Part I and Part II students who embarked on the FHS respectively in 2014/15 and 2013/14)

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Materials Options Paper 1	100
	Materials Options Paper 2	100
	Practicals & Industrial visits	80
	Engineering and Society coursework	20
	Team Design Project	50
	Characterisation or Modelling module	50
<i>Part I Total</i>		<i>800</i>
Part II	Thesis	400
<i>Overall Total</i>		<i>1200</i>

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS ECONOMICS AND MANAGEMENT, PART I EXAMINATION

Part I

A. STATISTICS

(1) Numbers and percentages in each category

The Part I Examination in Materials Economics and Management is unclassified. No distinctions are awarded. Since the number of candidates in this year and previous years is fewer than six, numerical data are confidential.

Category	Number			Percentage		
	2015/16	2014/15	2013/14	2015/16	2014/15	2013/14
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	n/a	n/a	n/a	n/a	n/a	n/a
Fail	n/a	n/a	n/a	n/a	n/a	n/a

(2) The use of vivas

As stated in the Examination Conventions, vivas are no longer used in the Part I examination.

(3) Marking of scripts

All scripts were double-blind marked by the Examiners. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

New procedures for dealing with mitigating circumstances, such as illness to a candidate, were introduced across the University as described in Part 13 of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations 2014. This change was captured in the Examination Conventions distributed to candidates.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

The new procedures for dealing with 'Factors Affecting Performance' (FAPs) should be reconsidered. Last year's examiners reported:

1. Mechanisms for ensuring consistency in responding to FAPs from year to year and between Examination Boards need to be established. Devolving decision making to the individual Examination Boards is likely to generate inconsistency in how mitigating circumstances are treated, which may in turn risk the University's reputation for fairness. A more centralised process at Divisional or University level would help achieve a consistent approach and be more in line with other institutions.
2. The wealth of experience in dealing with mitigating circumstances accumulated over many years within the Proctors Office is not available within the individual Examination Boards. Serious consideration should be given to returning FAPs to the Proctors Office and if necessary increasing the resource available there.

This year's examiners (five out of six of whom differ from last year) endorse these points. We recognise that the Examiners are best placed to assess how marks may be adjusted given a case, but only once a case has gone through the Proctors office to assess the validity and impact and to conduct any further enquiries.

A consequence of the new FAP process is that it places the burden on the student to ensure the provision of all material that can be considered, including in getting other bodies (college, doctor etc.) to submit information on their behalf at a time when they are likely coping with the effects of illness or particular difficult circumstances that affect their performance to be able to do such things. This contrasts with the previous system in which further clarification or evidence could be sought if necessary. This would appear to be an unacceptable deterioration in fairness to the students.

D. EXAMINATION CONVENTIONS

The current year's Conventions were put on the Departmental website and sent electronically, along with other information in a letter from the Chair of Examiners to all candidates, on 08 March 2016, and in hard-copy for the start of Trinity term. The Examination Conventions were agreed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There was one candidate for the examination. The examination consisted of seven written papers plus coursework that included a team design project, industrial visit reports and practical work carried out during the 2nd and 3rd year. One of the written papers (Introductory Economics) is taken in the 2nd year.

The written papers consisted of four Materials papers, two Economics papers and one Management paper, each of which lasted three hours. For the Materials papers, candidates were required to answer five questions out of eight, as in previous years. The Economics and Management Examiners followed their usual procedures.

Team design projects were marked by two Examiners. Teams were marked as groups containing MS and MEM students. The allocation of bonus or penalty marks is permitted under the Conventions, but this was not applied by the examiners this year.

Reports for each of the industrial visits were assessed by the Industrial Visits Organiser, appointed as Assessor.

All MS and MEM general papers results were considered by the examiners and it was agreed that the papers were fair.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

There was one candidate: male. With these small numbers, the breakdown of the results is confidential (see Section E).

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

(1) Breakdown of the results by gender

mark (%)	Overall mark		Written Examinations		Coursework	
	Male	Female	Male	Female	Male	Female
40–50	-	-	-	-	-	-
50–60	-	-	-	-	-	-
60–70	1	-	1	-	-	-
70–80	-	-	-	-	1	-
80–90	-	-	-	-	-	-
Totals	1	-	1	-	1	-

The performance of the male and female candidates was as follows:
Written Papers Averages – M 63.29, F N/A (Overall 63.29%)

Coursework Averages – M 75.0%, F N/A (Overall 75.0%)
Overall Part I Averages – M 65.0%, F N/A (Overall 65.0%)

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. H.E. Assender (Chair)

Prof. S. Lozano-Perez

Prof. T.J. Marrow

Prof. P.D. Nellist

Prof. R.C. Reed

Prof. P.R. Wilshaw

Dr. C.D. McKenna (Management)

Prof. A.D. Morrison (Management)

Prof. T. Powell (Management)

Dr S.G.B. Cowan (Economics)

Prof. M.J. Ellison (Economics)

Prof. M.G. Burke (External)

Prof. M.J. Reece (External)

Prof. B. MacCarthy (External, Management)

Dr H. Weeds (External, Economics)

General Paper 1 – Structure and Transformations

See report under Materials Science Part I

General Paper 2 – Electronic Properties of Materials

See report under Materials Science Part I

General Paper 3 – Mechanical Properties

See report under Materials Science Part I

General Paper 4 – Engineering Applications of Materials

See report under Materials Science Part I

Examiners' Report for MEM Part I 2016 – Economics Papers

Report on Introductory Economics (June 2015)

The Introductory Economics paper was taken by 344 candidates (229 PPE, 86 Economics and Management, 13 History and Economics, 16 E(M)EM). The paper discriminated well between candidates: at the top end there were some excellent scripts, at the other end a significant number demonstrated a dismal level of knowledge and understanding of basic concepts, resulting in failing marks being awarded.

This examination was the second since the changes to the microeconomics part of the course, which were designed to improve students' economic intuition and grasp of basic concepts.

Answers to parts of questions that required explanation of economic ideas were still rather poor, and, in general, the quantitative questions tend to have little explanation. Many candidates failed to explain the core concepts they were using to answer the question, or explain the approach they decided to follow.

Previous examiners' reports and the document "Advice for Undergraduates Preparing for Examinations in Economics," have emphasised that answers to problem questions should contain full explanations and economic interpretation. We would like to reiterate this advice. Without explanations or sufficiently detailed discussion the answer cannot be considered complete and will be marked down.

Comments on Individual Questions

Part A (candidates must answer three out of six multi-part questions)

1. Utility and Demand (28% of candidates)

This question proved to be a good discriminator between candidates. Most got part A, or at least headed in the right direction, and candidates seemed to find part B quite easy. Possibly, in retrospect, there were too many marks for part B relative to the other parts. Many students failed to understand that the utility function was not defined for zero of either good; many simply did not know what log of zero was. Some students showed difficulties with the general manipulation of logs and were unable to provide a numerical answer to part (f) of the question. Very few candidates solved the welfare cost part, though some gave an intuition.

2. Supply and Demand (75% of candidates)

This question was well answered and very popular. A surprising number made the mistake of setting quantity equal to 27 million even though the question is clear that this is revenue. Most candidates realised that part (b) implied a horizontal supply curve; those that did not then naturally struggled through the rest of the question. Some showed that £3 tax was revenue maximising by calculating revenue at just above and just below £3. The better candidates correctly solved the maximization problem. Many failed to provide explanations in their answers to this question: they did not explain the concepts of deadweight loss, or consumer and producer surpluses, and how they went about calculating those measures. In parts (e) and (f), some candidates did not explain the numerical approaches followed in each question.

3. Monopoly and Oligopoly (76% of candidates)

This was another very popular question. Some candidates got the highest and lowest elasticity points mixed up, but most correctly identified the point where elasticity was equal to -1. Profit and revenue maximization points were generally identified, though many candidates did not appreciate that the revenue maximization result (equal to perfect competition in this case) would not in general be true. A considerable number of candidates could not get the Cournot-Nash equilibrium, and most failed to recognise the unusual properties of the revenue maximization outcome (in spite of the question giving a hint). The best candidates provided good intuitive explanations for part (a), to go along with the algebra.

4. IS/LM Mundell Fleming (83% of candidates)

The most popular macro question in part A. This was a textbook exercise in Mundell-Fleming. In part (b) the first two changes caused little difficulty for most students but the second two were generally poorly answered. Candidates have clearly been trained in simple shifting of IS and LM curves, but have less familiarity with changes that, for example, work through the money market diagram to shift the LM curve. A surprising number of candidates did not seem to realise that part (e) called for an AS-AD diagram demonstrating how to move to the new equilibrium with flexible prices. The best answers in part (b) showed the impact in the relevant market (money or goods and services markets), and explained the adjustment mechanism from the initial equilibrium to the new one

5. IS Curve Analysis (27% of candidates)

The majority of candidates successfully calculated the slope of the IS curve under the two tax systems, though comparatively few understood the economic intuition as to why a proportional tax would change the economy's response. Most realised that monetary policy was more effective if consumption depended on interest rates, but most did not formally show that the IS curve became flatter, which is the key point. A number of candidates were confused between marginal and average propensity to consume. In part (c) the best candidates showed that the new IS was flatter; the best candidates also they explained well the adjustment mechanism after expansionary monetary policy. In part (d) there were some good references to Kuznets and the consumption puzzle.

6. Monetary Policy (10% of candidates)

Relatively few candidates attempted this. In part (b) the best answers checked whether there was an incentive to deviate. There were few answers that did this.

Part B (candidates had to answer one out of four essay questions)

7. Externalities (54% of candidates)

This was the most popular essay question by quite a large margin. It was perhaps a little “too textbook” a question, with most students showing the diagram of the marginal private and social costs demonstrating that output was too high. The potential solutions were shown to be capable of producing the socially optimal output. Some candidates failed to have an accurate diagrammatical representation of the Pigouvian tax. Better candidates took seriously the issue of which solution would be better to use and the impacts on government revenue. The best answers analysed the question under uncertainty and used diagrams to illustrate the best option under different assumptions regarding the relative slopes of the MB and MC of pollution abatement curves.

8. Nash equilibrium (18% of candidates)

The majority of candidates used the Cournot v Bertrand example to illustrate Nash equilibrium. Surprisingly few commented that this example illustrated that while Nash equilibrium is useful as a solution concept, it does not help policymakers determine which model is more useful. Few candidates discussed how co-operation could be an equilibrium in a repeated game.

9. Unemployment (13% of candidates)

Overall candidates provided some sensible responses to this question. The best discussed both why the size of the shock could have been different across countries e.g. size of banking sector, exposure to foreign competition, etc., and why labour market institutions, such as minimum wages, benefits, and unions, may have hindered real wage responses. A few discussed the issue of the one-size-fits-all monetary policy in the eurozone. Candidates also discussed the impact of austerity measures.

10. Government Debt (16% of candidates)

Among the essays, this question generated the most variability in quality of answers. Some thought carefully about how the debt-to-GDP ratio changed due to (a) deficits and (b) interest rates v growth rates, and argued that austerity to reduce the deficit could also harm GDP and hence make the ratio worse. Many commented on the fact that a high ratio may raise risk premia and make the country more vulnerable to future shocks. Few discussed how to make fiscal policy sustainable over the long-run e.g. through the use of budget rules. A few candidates made reference to the Stability and Growth Pact.

H. SMITH

J. PIRES

Core Microeconomics – Examiners’ Report 2016

Part A

This was first year of a new exam format in which all questions in Part A were compulsory. There were four questions of unequal length (different marks weightings). The questions themselves presented no particular difficulties, but many students did not complete the fourth question, either because they ran out of time, or because it was somewhat more difficult than the rest. (It should be noted that, since all questions have to be answered by all candidates, there is no expectation that they should be of equal difficulty. Some harder questions, or parts of questions, may be included in section A to give good candidates an opportunity to shine.)

1. **Bertrand Competition.** Generally well answered. Most candidates correctly stated the model and gave the intuition of undercutting prices to reach MC but many did not prove that prices equal marginal cost was in fact an equilibrium. Part (b) was well answered with the most popular alternatives being different marginal cost and differentiated products.
2. **Risk Preferences.** Part (a) was just a definition that caused no problem. Part (b) was answered in an intuitive way, which was acceptable, but it was disappointing to see very few more sophisticated precise answers. Part (c), which was a typical textbook question, should have caused no problem but surprisingly many students struggled with it, with the usual mistake of taking the price out of the utility function.
3. **Adverse Selection.** The first and second part of the question were done well, although the second one with some variability, mainly due to sloppy exposition and difficulties determining the equilibrium price. Part (c) was badly answered. There was a degree of misunderstanding of the question. Some students thought that the types of the buyers and sellers in the previous period were common knowledge. A frequent argument was: if an X consumer puts its bike on sale, it can be deduced that it is a high quality bike (since the others were sold in the previous period) and hence a Y or Z type will bid for it.
4. **Public Good.** Many students did not complete the question. Part (a) was generally well answered. Part (b) was answered by only about 60% of candidates, but was generally well done. The mistakes were accumulated in later parts, so it was difficult to achieve full marks. Some students who didn’t solve early parts were able to obtain some marks by providing intuition or stating how to solve the problem.

Part B

The most popular questions were 6 and 7 – both of which allowed candidates to write rather standard answers, using little technical analysis, if they chose to do so. The examiners were disappointed that so few candidates took the opportunities provided by these questions for independent analysis and insight.

5. **Increasing Returns to scale** (11% of candidates)

This was the least popular Part B question, but the answers were generally good. Very few discussed the spill-over cause of increasing returns and their effect on the economy. The policy part of the question was not well explored in by many candidates.

6. **Externalities – greenhouse gases** (46% of candidates)

This was the second most popular question, attracting 2;1 level answers with very little variance. It was a safe/standard essay in which the last part gave an opportunity to provide some originality. Very few were able to excel.

7. **Competition Policy – Mergers** (49% of candidates)

Another straightforward question. Most students relied on very standard lecture or textbook material. A few good answers were able to provide a clear explanation and independent analysis of the material.

8. **Scope for Insurance** (18% of candidates)

This question provided the opportunity to discuss several concepts in risk management, such as risk pooling, insurance etc. There was no single obvious way to approach it. It was an unpopular question, and few managed to give a coherent answer of how insurance can arise among risk-averse agents.

9. **Moral Hazard Principal Agent contract** (39% of candidates)

Standard and guided question that was in general well answered, but there were few excellent answers.

10. **Cournot Competition** (38% of candidates)

The long problem was popular this year with more than a third of candidates choosing it. As usual there was high variance in the marks for this question. Part (a) and (b) were quite standard and done well. In part (c) many students failed to see the strategic effect that an increase in q_1 implied in q_2 . There was more variability in the answers to part (d). Many candidates failed to describe the strategies properly, in particular by stating for both firms what to do if Firm 1 did not invest. Very few managed to answer part (e) correctly and provide a good explanation in part (f).

Examiners' Report for MEM Part I 2016 – Management Papers

General Management First Public Examination, Trinity 2016

General comments

The overall standard of scripts was good, with most scripts reaching 2i standard, and a fair number achieving a higher standard.

At the top end, candidates produced clear, insightful and comprehensive answers to some tricky essay and problem questions, which showed wide reading, independent thoughts and critical analysis across the syllabus. These answers were organised into a clear, coherent structure, and were supported with good examples and/or illustrations, including original examples. Weak answers simply repeated facts or listed key points from various readings and/or the lectures, which were only tangentially related to the examination questions, and failed to construct an argument addressing the question or quotation. This includes the dubious reuse of examples from different contexts.

Relative to previous years, there was some decline across candidates generally in their focus on the questions set, with a good many reproducing tutorial essays rather than focussing on the exact terms of the question, or ignoring one part of a two-part question. Maintaining precision in understanding, in critical analysis, and in responding to the exact question set across all questions answered is a vital skill in the examination context. It cannot be over-emphasised to candidates that the examination rubric provides a step mark of 55 (2ii) for *“a well-constructed essay that fails to address the question asked.”*

It should be noted, that even in strong first class scripts, performance was not always sustained at the same high level across all four questions answered. Conversely, some weaker lower second class scripts had one strong answer suggesting a higher capacity for performing than the student exhibited generally. It has frequently been commented on in the past that a major reason for some candidates under-performing is a failure to pay adequately close attention to the exact question set, and a tendency instead to repeat well-rehearsed points relevant to the topic in general terms. Both may reflect candidates not having ensured that they had command across the breadth of the syllabus, which caught them out in providing four strong answers.

Finally, many students did not seem to have paid attention to the learning goals stated in the reading list, which provided explicit guidance in terms of the expected breadth and depth in which the material should be mastered. Occasionally candidates tried to bluff their way through answers with various on-the-spot inventions of fact or argument. Some astonishing facts that were learnt from the examination, included Henry Ford having founded his company in the early 19th century and/or having invented the automobile, and the CEO of General Electric having a compensation level of some \$20 billion per annum (which might have seemed even more disproportionate had the candidate not noted that this was “only” 400 times the average American household wage).

Some additional attention might be given to legible handwriting, which handicapped some answers, and caused a disproportionate amount of effort to be expended in deciphering them. A surprising number of candidates were also unable to follow the simple instructions for examination scripts, again causing unnecessary effort and/or annoyance in marking.

Although less disproportionate in relation to recent years, a small number of questions were more popular than others, especially in Part B. This may be related to the point above about students not having studied in sufficient breadth.

Specific comments

1. Has outsourcing changed the boundaries of the firm? Are these boundaries still relevant today?

Number answering = 12

To answer this question well, students needed to understand both the introductory material on firms and hierarchies, and in particular Coase, Williamson, and transactions cost theory, and the concluding material on operations and supply chain management. Knowledge of Chandler and the historical evolution of the modern corporation was helpful. Weaker answers were unable to give an accurate account of transactions costs and/or outsourcing. Stronger answers were supported with good examples and/or critique of the concept of boundaries.

2. 'Henry Ford's "5 dollar day" was a noble and unselfish contribution to mankind.' Do you agree?

Number answering = 25

Most answers were able to give a good historical account of Ford's implementation of the "five dollar day," including an understanding of the value of such pay, its role in the running of the plant, and its market consequences. Weaker answers dwelt on this at perhaps too much length. Stronger answers were able to contextualise the Fordist production system, and provide some critique of this concept. Weaker answers muddled up Fordism and Taylorism, despite injunctions to understand the differences between the two.

3. Would industry-based structure analysis or the resource-based view be more attractive to the CEO of General Electric? Why?

Number answering = 16

As comparing and contrasting these two strategy approaches drew heavily on both the tutorial essay readings and on lecture material, a good answer required students to recognise that General Electric engages in multiple industries, which was highlighted in the lectures. A nodding acquaintance with the thesis of Chandler's *The Visible Hand* and associated readings on the reading list, discussed in the lectures, proved helpful in the better answers. Given an adequate understanding of General Electric's scope of business, it was possible to support either approach to strategy, but also to highlight the difficulties associated in applying each.

4. What do the lessons of Honda have to offer strategic planning today?

Number answering = 30

This was one of the more popular questions in Part A. Weaker answers simply recounted the Honda debate from *California Management Review*, without relating them to strategic planning in today's environment. Stronger answers were able to identify significant shifts in the political, economic, social, and technological environment, and to suggest what aspects of the Honda example might be relevant or irrelevant in contemporary strategic planning.

5. What system of corporate governance best protects shareholders' interests?

Number answering = 10

Most answers were able to compare and contrast the main systems of governance, and their primary features, and to introduce the idea of the principal-agent problem. Better answers were able to provide a nuanced and supported discussion of how each system related to shareholders' interests, and to suggest not only which best protected shareholders' interests, but differences between different types of shareholders. Some weak answers seemed confused as to what being a shareholder meant.

6. 'Ultimately all management ideas are fads and fashions.' Do you agree?

Number answering = 32

Some answers to this question focused only on whether management knowledge is scientific or not. Although this was useful for providing a critique of the statement, a good answer also explained at least briefly the concept of "fads and fashions", and how it applied to management ideas. A few answers effectively contrasted "fads and fashions" with isomorphism and adaptive emulation.

7. Are modern corporate leaders' approaches to power more aligned with Machiavelli or Foucault?

Number answering = 4

Given the small number of students answering this question, it is not possible to provide an analysis. A good answer would take in leadership as well as power, and consider both Foucault and Machiavelli rather than only one of the two. Two answers gave muddled accounts of Foucauldian and Machiavellian approaches by, for example, claiming that Foucault advocated coercion, and that Machiavelli espoused a collaborative orientation.

8. According to Meek, "Treating culture as emerging form social interaction – treating it as something that the organisation 'is', rather than treating it as a variable that can be manipulated by management – has obvious implications." Discuss.

Number answering = 15

A number of students were unable to resist the temptation to regurgitate the tutorial essay on culture rather than to engage with Meek's proposition. More discerning students were able to see the implications of the quotation, and to consider critically the implications of "culture is" for the perspectives of Schein, Barney, and other authors writing on culture. Weaker answers simply summarised Schein's levels of culture and Barney's disquisition on whether culture could be a source of sustainable competitive advantage.

9. Is social media creating new professions?

Number answering = 7

Some students used this question simply to discuss branding and the advent of social media, which was not an effective strategy for answering. Better answers differentiated between jobs, occupations, and professions, and applied various schema relating to professionalization to emergent occupations, in some cases effectively contrasting them with "traditional" professions such as law and/or with "quasi-professions" such as management. It was surprising to find in some answers that marketing and branding had only emerged with social media.

10. Is McDonalds providing a product or a service? What implications do your answer have for operations and supply chains management

Number answering = 13

An effective answer reflected on whether McDonald's was providing a product or a service, and recounted the implications of the answer for McDonald's supply chain. Some concepts that were used in support included accounts of George Ritzer's concept of "McDonaldisation", and Levitt's ideas on service. A few answers broached the "quasi-manufacturing" explicitly or implicitly. The recognition that McDonald's is experimenting with automating counter-service in some locations offered the opportunity for some interesting reflection.

11. Are traditional theories of why and how people consume adequate for modern era?

Number answering = 3

This question received the fewest number of responses. A weak answer related Veblen's theory of conspicuous consumption without reflecting critically on the applicability of his statements in the present day (asserting, on the contrary, that all consumption can be seen as conspicuous in the age of social media). A strong answer brought in other readings in more recent consumer culture theories, and reflected on how consumption may shape markets as well as purchase behaviour. One answer delivered a paper on marketing theory, failing to describe the distinction between marketing and consumption.

12. How do organisations change, and why?

Number answering = 13

Those students who went beyond simply recreating the tutorial essay on organisational change, for example contrasting selection by external forces versus internal adaptation, performed well on this question. Weaker answers either only addressed change, or only addressed culture.

13. Would Alfred Chandler recognise management as it is practiced by today's organisations?

Number answering = 24

Most students were able to provide a good account of Chandler's three-pronged theory, although fewer linked this to the emergence of the modern divisionalised corporate form than perhaps might be expected. Good answers related Chandler to the historical context, identified changes in the modern business context, and then speculated how this might strike Chandler. A few students seemed to be proposing, counterfactually, that Chandler was writing about contemporary phenomena throughout the historical period that he treats.

14. How could different understandings of brands inform business strategy?

Number answering = 42

The most popular question in Part B. Again, some students simply reproduced tutorial essays on branding rather than engaging with the question and demonstrating some idea about different understandings of brands. Others ignored the "business strategy" prompt and stopped with marketing strategy, which was perhaps necessary but certainly not sufficient. The strongest answers clearly linked different ways understanding brand equity to consequences for formulating business strategies, and vice versa. Some weaker arguments resorted to relating branding anecdotes with no backing theory. Veblen was occasionally, and unfortunately, offered as an example of branding theory.

15. Suppose you are an entrepreneur pitching an idea for a company. What are three key ideas from the General Management course you would draw on in your pitch, and why?

Number answering = 39

A very popular question. It was possible to "pitch" a wide range of answers from the General Management course to answer this question well, although quite a few centred around strategy, technology, marketing, and operations, not surprisingly. Some students seemed to be unclear on the definition and role of an entrepreneur. Others seemed to understand the question as a general inquiry as to the usefulness of the course, instead of focusing on which theories may be of help to entrepreneurs thinking about their investors. The strongest answers linked the three theories in what could be the beginning of a solid business plan.

16. Do different cultures need different styles of leadership?

Number answering = 39

Another very popular question. Students could take “culture” as either organisational culture or national culture, or consider both, in answering this question. A few students brought in Martin and her three models of culture to increase the sophistication of their answers. A few weaker answers were unable to distinguish between leading and managing. Overall, references to leadership readings were very limited. Some students replaced “culture” with “change.”

17. Are models of executive compensation universal or culturally specific?

Number answering = 21

In answering this question well, it was useful to show in the discussion an understanding of the components of executive compensation, rather than taking it simply as “pay”. There were a few really good answers that drew on corporate governance, and/or the role of actors such as corporate boards, shareholders, HR compensation committees, consultants, etc. Weak answers showed no depth of understanding.

18. Are organisations purposeful?

Number answering = 10

This was the least popular Part B question. Most students chose to recast the question as “do organisations have a purpose”, with many aligning themselves with Milton Friedman’s famous dicta. A few students considered organisations as collectivities versus simply collections of individuals. At least one answer rather successfully questioned the usefulness of anthropomorphising organisations, whereas another tried to equate purpose with rationality.

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS ECONOMICS AND MANAGEMENT, PART II EXAMINATION

Part I

A. STATISTICS

(1) Numbers and percentages in each category

Candidates are given a mark on the basis of their performance in the Part II examination and then given a classification on the basis of their performance across Part I and Part II. Since the number of candidates this year and last is fewer than six, numerical data are confidential (see section E, below).

Class	Number			Percentage (%)		
	2015/16	2014/15	2013/14	2015/16	2014/15	2013/14
I	n/a	n/a	1	n/a	n/a	11.11
II.I	n/a	n/a	7	n/a	n/a	77.78
II.II	n/a	n/a	1	n/a	n/a	11.11
III	n/a	n/a	-	n/a	n/a	0
Pass	n/a	n/a	0	n/a	n/a	0
Fail	n/a	n/a	0	n/a	n/a	0
Total	2	3	9	-	-	-

(2) The use of vivas

Vivas were not used for this Examination.

(3) Marking of scripts

All scripts were double-blind marked by the Examiners and Assessors. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

New procedures for dealing with mitigating circumstances, such as illness to a candidate, were introduced across the University as described in Part 13 of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations 2014. This change was captured in the Examination Conventions distributed to candidates.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

The new procedures for dealing with 'Factors Affecting Performance' (FAPs) should be reconsidered. Last year's examiners reported:

1. Mechanisms for ensuring consistency in responding to FAPs from year to year and between Examination Boards need to be established. Devolving decision making to the individual Examination Boards is likely to generate inconsistency in how mitigating circumstances are treated, which may in turn risk the University's reputation for fairness. A more centralised process at Divisional or University level would help achieve a consistent approach and be more in line with other institutions.
2. The wealth of experience in dealing with mitigating circumstances accumulated over many years within the Proctors Office is not available within the individual Examination Boards. Serious consideration should be given to returning FAPs to the Proctors Office and if necessary increasing the resource available there.

This year's examiners (five out of six of whom differ from last year) endorse these points. We recognise that the Examiners are best placed to assess how marks may be adjusted given a case, but only once a case has gone through the Proctors office to assess the validity and impact and to conduct any further enquiries.

A consequence of the new FAP process is that it places the burden on the student to ensure the provision of all material that can be considered, including in getting other bodies (college, doctor etc.) to submit information on their behalf at a time when they are likely coping with the effects of illness or

(2) [REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

(3) [REDACTED]

[REDACTED]

(4) [REDACTED]

[REDACTED]

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

- Prof. H.E. Assender (Chair)
- Prof. S. Lozano-Perez
- Prof. T.J. Marrow
- Prof. P.D. Nellist
- Prof. R.C. Reed
- Prof. P.R. Wilshaw
- Dr. C.D. McKenna (Management)
- Prof. A.D. Morrison (Management)
- Prof. T. Powell (Management)
- Dr S.G.B. Cowan (Economics)
- Prof. M.J. Ellison (Economics)

- Prof. M.G. Burke (External)
- Prof. M.J. Reece (External)
- Prof. B. MacCarthy (External, Management)
- Dr H. Weeds (External, Economics)

Materials Options Paper 2

See report under Materials Science Part I

Examiners' Report for MEM Part II 2016 – Economics Papers

No Economics papers were selected by the 2016 MEM Part II candidates from the suite of Economics & Management options

For 2016 FHS Economics papers please see PPE FHS Examiners' Reports at https://weblearn.ox.ac.uk/portal/hierarchy/socsci/econ/curr_student/undergrad/examinations/page/home

Examiners' Report for MEM Part II 2016 – Management Papers

Written Papers

**FINAL HONOUR SCHOOL
ECONOMICS & MANAGEMENT
2015-16
INTERNAL EXAMINERS' REPORT**

FINANCE

FINANCE PAPER EXAM REPORT

Exam results were strong. The course is in transition with a new lecturer and some revamp of topics covered. Given the need for the paper to cover the material taught in 2014/5, the paper remained "fat", giving students more choice. There has been a shift in emphasis towards essays since 2012/2013, which should be taken further in 2017.

All but one student chose to do two essay questions from part A. Average marks were slightly higher in Part A (67.4) than in Part B (65.8), and the variance in marks was higher in Part B. There was a reasonably uniform distribution across questions.

Specific comments about the questions are as follows.

Question 1 was a fairly straightforward question about the capital asset pricing model, and was the most popular question, answered by 38 students. This is a core topic of the early part of the course, building on the year 1 course. Performance was generally good, but there were few outstanding answers.

Question 2 was on hostile acquisitions. Good answers discussed these clearly in the context of principal-agent issues, and alternative models of corporate governance. This was mostly answered well.

Question 3 was a question on the impact of taxation on valuation and dividends. It was not chosen by any candidate, perhaps because this topic had been taught rather differently in the two years 2014/5 and 2015/6 (a similar question had been included last year, and again few students answered it). This is an topic to consider some revision in 2016/7.

Question 4 was about home bias in international investment portfolios. This was a specific topic covered at the end of the course in each year. Performance was generally good.

Question 5 was about the causes of the financial crash. On the whole this was reasonably well answered, although there was a tendency for students to describe events rather than analyse fundamental causes. This interpretation was probably not helped by a subtle change in the wording at proof stage which took place without the knowledge of the examiner.

Question 6 was a fairly straightforward question about firm gearing and the Modigliani-Miller proposition. This was also a popular question, and produced solid, rather than exceptional answers.

Question 7 was a question about the equity risk premium puzzle and the excess volatility puzzle. This was covered in much more detail in 2015/6 and consequently was much less popular. However, it was generally answered well.

Question 8 asked how moral hazard and adverse selection might affect the availability of external finance. This topic was introduced for the first time in 2015/6, and was answered (very well) by only one student.

The last 3 questions, 9 to 11 in Part B, were quantitative. However, each of them illustrated deeper questions; good answers recognised the deeper questions and explained how the quantitative answers shed light on them.

Question 9 was the most popular question overall. This covered similar ground to Question 6 and was intended to make students recognise the trade-off theory in corporate finance, where the tax advantage of debt is balanced against costs of financial distress, except that in this case there was no tax and so the optimal level of debt was zero. Few students managed to explain this clearly, despite many of them setting out the theory clearly in Question 6. This question had the lowest overall average mark.

Question 10 drew on problems of adverse selection and the effects on investment decisions. This had been covered most clearly in 2015/6, but should have been accessible also to students who took the module in 2014/5. In the event few students attempted the question, and there was a high variance in the results.

Question 11 was a question about whether make staff redundant or undertake a new investment. The main point was that it might be advantageous to undertake the project even if it had a negative NPV. Most answers correctly identified this issue, and the question was generally well answered.

Management Project

No report is produced

Examination Conventions 2015/16

Materials, Economics and Management - Final Honours School¹

1. INTRODUCTION

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These Conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. Normally the relevant Regulations and Course Handbook are the editions published in the year in which the candidate embarked on the FHS programme.

The attention of candidates for Part I of the Examination is drawn to key phrases in clauses 6 and 7 of Section A and under Part I of Section B of the Special Regulations for the Honour School of Materials, Economics and Management:

Section A. 6. ...no candidate may present him or herself for examination in Part II unless he or she has been adjudged worthy of Honours by the Examiners in Part I.

Section A. 7. To achieve Honours at Part I normally a candidate must fulfil all of the requirements under (a), (b) & (c) of this clause. (a) Obtain a minimum mark of 40% averaged over all elements of assessment for the Part I Examination, (b) obtain a minimum mark of 40% in each of at least four of the six written papers sat in Trinity Term of the year of Part I of the Second Public Examination, and (c) satisfy the coursework requirements set out in Section B, Part I [of the Regulations].

Section B. Part I. In the assessment of the Materials coursework, the Examiners shall take into consideration the requirement for a candidate to complete satisfactorily the coursework to a level prescribed from time to time by the Faculty of Materials and published in the Course Handbook. Normally, failure to complete satisfactorily all three elements of Materials Coursework will constitute failure of Part I of the Second Public Examination.

The examiners are nominated by the Nominating Committee^{*} in the Department of Materials and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners are independent of the Department and of those who lecture courses. However, for written papers on Materials Science in Part I and Part II, examiners are expected to consult with course lecturers in the process of setting questions. The paragraphs below indicate the conventions to which the examiners usually adhere, subject to the guidance of the appointed external examiners, and other bodies such as the Academic Committee in the Department, the E(M)EM Standing Committee, the Mathematical, Physical and Life Sciences Division, the Social Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners.

The Materials, Economics and Management Examiners in Trinity 2016 are: Prof. Hazel Assender (Chair), Prof. James Marrow, Prof. Pete Nellist, Prof. Sergio Lozano-Perez, Prof. Peter Wilshaw and Prof. Roger Reed (examiners from the Department of Materials Science); Dr Chris McKenna, Prof. Alan Morrison, Prof. Thomas Powell (examiners from the Said Business School); and Dr Andrea Ferrero, Prof. Martin Ellison, (examiners from the Department of Economics). The external examiners are Prof. Grace Burke, University of Manchester; Prof. Mike Reece, Queen Mary, University of London; Dr Helen Weeds (Economics, University of Essex) and Prof. Bart MacCarthy (Management, Nottingham University Business School).

It must be stressed that to preserve the independence of the examiners, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via the candidate's college, who will, if the matter is deemed of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Examiners.

¹ See also the Annex to the Conventions that covers in greater detail the marking for Economics & Management papers

^{*} for the 2015-16 examinations the Nominating Committee comprised Prof Grovenor & Dr Taylor.

If there are believed to be mitigating circumstances, such as illness, which may have affected the candidate's progress with coursework or performance in a written exam these should be drawn to the attention of the candidate's college as soon as practicable. Candidates should complete the form entitled 'Factors affecting performance in examinations' and submit this to the college with appropriate supporting material. The Senior Tutor of the college will submit the application to the Registrar for forwarding to the Chairman of Examiners for consideration according to Part 13 of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations 2015/16.

During the marking process the scripts of all *written* papers remain anonymous to the markers.

[In some of the descriptions of marking for individual elements of *coursework* that are given later in this document the term 'double marked, blind,' is used; this refers to the fact that the second marker does not see the marks awarded by the first marker until he or she has recorded his or her own assessment, and does not indicate that the candidate is anonymous to the markers.]

Procedures covering late submission of or failure to submit/deliver one or more elements of coursework to the Examiners

The Examination Regulations stipulate specific dates for submission of the required elements of coursework to the Examiners (1. A set of nine reports of practical work as specified in the Course Handbook (normally each individual report within the set has been marked already as the laboratory course progresses); 2. A Team Design Project Report and associated oral presentation; 3. A set of four Industrial Visit Reports as specified in the course handbook; and 4. A Part II Management Project Report). Rules governing late submission of these four elements of coursework and any consequent penalties are set out in the 'Late submission and non-submission of a thesis or other written exercise' clause of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (Part 14, 'Late Submission, Non-submission, Non-appearance and Withdrawal from Examinations' in the 2015/16 Regulations).

Under the provisions permitted by the regulation, late submission of an element of coursework, as defined above, for Materials, Economics & Management examinations will normally result in one of the following:

- (f) With permission from the Proctors under para 14.7 no penalty.
- (g) With permission from the Proctors under paras 14.9 and 14.10, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work, and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Examiners with due consideration given to the circumstances and to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners". The reduction may not take the mark below 40%.
- (h) Where the candidate is not permitted by the Proctors to remain in the examination, he or she will be deemed to have failed the examination as a whole.
- (i) Where, without the permission of the Proctors under paras 14.9 and 14.10, work is proffered so late that it would be impractical to accept it for assessment a mark of zero shall be recorded and, as per the Special Regulations for the Honour School of Materials, Economics & Management, normally the candidate will have failed Part I or II as appropriate of the Examination as a whole.
- (j) Where no work is submitted a mark of zero shall be recorded and, as per the Special Regulations for the Honour School of Materials, Economics & Management, normally the candidate will have failed Part I or II as appropriate of the Examination as a whole.

Where an element of coursework is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case *for the element of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires a minimum mark of 40% if the candidate is not to fail the examination as a whole.

Elements of coursework comprising more than one individual piece of assessed coursework

Penalties for late submission of individual practical reports are set out in the 2014/15 MS/MEM FHS Handbook and are **separate** to the provisions described above.

The consequences of failure to submit individual practical reports or failure to submit/deliver other individual pieces of assessed coursework that contribute to one of the elements of coursework scheduled in the Special Regulations for the Honour School of Materials, Economics & Management are set out in the MS/MEM FHS Handbook (sections 7 and 10.8 of the 2014/15 version) and are **separate** to the provisions described above. In short normally this will be deemed to be a failure to complete satisfactorily the relevant element of Materials Coursework and will therefore constitute failure of Part I of the Second Public Examination.

Where an individual practical report or other individual piece of assessed coursework that contributes to one of the *elements* of coursework scheduled in the Special Regulations for the Honour School of Materials, Economics and Management is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case *for the individual piece of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires submission/delivery of every individual piece of assessed coursework if the candidate is not to fail the examination as a whole.

For elements of coursework with a defined word limit: if a candidate exceeds this word limit without permission normally the examiners will apply a penalty of 10% of the maximum mark available for the piece of work. [It is only possible to apply for permission to exceed a word limit if the Examination Regulations for the specific element of coursework concerned state explicitly that such an application is permitted, excepting that the Proctors may, exceptionally, under their general authority grant such permission.]

2. PARTS I & II

Candidates taking Ec1: Introductory Economics in the 2nd year.

MEM candidates sit the compulsory Ec1: Introductory Economics paper in Trinity Term of their 2nd year. This paper will be set and examined as for all other Part I and Part II Economics papers (see below) and contributes to the Part I mark. The marks for this paper will be formally ratified by the Board of examiners for Part I examinations held in the Trinity Term following that in which the Ec1 paper is sat.

Candidates for Part I (3rd year)

Part I candidates take four compulsory Materials papers (General Papers 1 – 4); one compulsory Economics paper; and one compulsory Management paper. In addition, candidates are assessed on their Materials coursework (practical work, the team design project, and industrial visits). Marks from the Ec1 paper sat in Trinity Term of the 2nd year are included in the Part I total.

Candidates for Part II (4th year)

Part II candidates take one compulsory Materials Options paper and one paper from a range of Management and Economics options. In addition they are assessed on their report of a six-month industrial placement, which carries the weight of two papers.

(1) *Setting of papers*

Part I Materials General Papers 1 – 4 are set by the Materials examiners in consultation with course lecturers. The responsibility for the setting of each examination paper is assigned to an examiner, and a second examiner is assigned as a checker. The Materials Option Paper in Part II is set by lecturers of the option courses and two examiners, the examiners acting as checkers. For the Materials papers, the examiners, in consultation with lecturers, produce model answers for every question set. The wording and content of all examination questions set, and the model answers, are scrutinised by all examiners, including, in particular, the external examiners.

The Economics and Management papers are set by examiners nominated respectively by the Economics Faculty and the Saïd Business School.

(2) *Paper Format*

Materials Papers

All Materials General Papers comprise eight questions from which candidates attempt five and are taken in Part I. Each question is worth 20 marks. The total number of marks available on each general paper is 100. The Materials Option paper comprises one section for each twelve-hour Options lecture course, each section containing two questions: candidates are required to answer one question from each of any three sections and a fourth question drawn from any one of the same three sections. The total number of marks available on each option paper is 100, and all questions carry equal marks. Questions are often divided into parts, with the marks for each part indicated on the question paper. Marking criteria are given in section 3.

Economics and Management papers

Candidates are advised to read particularly carefully the specific instructions on the front of each paper as to the number of questions they should submit, since the rubrics on Economics and Management papers differ slightly from those for the Materials papers.

(3) *Marking of papers*

Materials Papers

All scripts are double marked, blind, by the setter and the checker, each awarding an integer mark for each question. After individual marking the two examiners meet to agree marks question by question. If the differences in marks are small (~10% of the total available for the question, 2-3 marks for most questions), the two marks are averaged, with no rounding applied. Otherwise the examiners identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the examiners still cannot agree, they seek the help of the Chairman, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

The Materials Options paper is marked by course lecturers acting as assessors and an examiner acting as a checker.

The Materials external examiners provide an independent check on the whole process of setting and marking.

The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on their cover sheet which questions, up to the prescribed number, they are submitting for marking. If the cover slip is not completed then the examiners will mark the questions in numerical order by question number. If the candidate lists more than the prescribed number of questions then questions will be marked in the order listed until the prescribed number has been reached. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2(2) above will be awarded and (iii) the mark for the paper will still be calculated out of 100. In addition, for the Materials Options Paper, as per the rubric, the examiners will mark questions from only three sections. Should a candidate attempt questions from more than three sections the examiners will mark those questions from the first three sections in the order listed by the candidate on the cover slip. If the cover slip is not completed then the examiners will mark the sections in alphabetical order by section delineator (section A, section B, etc).

As the total number of students is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiners to adjust all marks for those papers. For the Materials papers such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

- a. Papers with a *mean taken over all candidates* of less than 55% or more than 75% are normally adjusted to bring the *mean* respectively up to 55% or down to 75%. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the paper.
- b. For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (a) above, the questions and typical answers are compared in order to ascertain, with the help of the external examiners, whether the marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the question or for the paper.
- c. The mean mark and the distribution of marks, both taken over all written papers, are considered, again with the help of the external examiners, in order to ascertain whether these overall marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the overall marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's overall score.

Economics and Management Papers

The rubrics on Management and Economics papers differ slightly from the above, but numerical marking is used and all examiners mark to the standard class boundaries [see section on classification] and range of marks (0-100). All scripts in Economics and Management are double-marked, blind. The two assessors who marked the script then meet in order to reach an agreed mark. Should they fail to agree, then the appropriate set of Economics and Management Examiners will determine the final mark.

In cases of short weight, the maximum achievable mark is lowered by the proportion of the paper missing. (For example, in a paper requiring four answers where a candidate has attempted only three, the maximum achievable mark is 75.) In cases where an answer has been partially completed, the marker's will use their discretion to decide what proportion of the answer is missing. Marks reflecting such a penalty are flagged "SW" with the proportion of the paper completed (e.g. "SW 75%"). In the case of overweight papers it is left to the discretion of the two markers to decide which of the material to disregard. In cases where the rubric requires candidates to show a specified breadth of knowledge, and where it is unambiguously clear that such a requirement has not been met, the mark for the script will be lowered by at least 5 points. Marks reflecting such a penalty are flagged by "RR" with the number of marks deducted.

As the total number of MEM students is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiners to adjust all marks for those papers. Where a paper has been taken by both MEM and EEM students normally the decision will be informed by the mean and the distribution of marks taken over all EEM & MEM candidates for that paper. Such adjustment is referred to as 'scaling' and in deciding what scaling, if any, to apply normally the examiners will take into account the following additional information:

- (a) For each paper, comments from the MEM examiners representing the Economics or Management Faculty as appropriate
- (b) A report by the Chairman of Examiners on any scaling adopted by the EEM examiners
- (c) The performance of the MEM cohort and the MEM+EEM cohort on the other Economics and Management papers
- (d) The performance of the MEM cohort on the Materials papers

(4) *Marking of Practicals for Part I*

Practicals are assessed continually by senior demonstrators in the teaching laboratory and in total are allocated 50 marks. Part I examiners have the authority to set a practical examination. Penalties for late submission of an individual practical report are prescribed in the Course Handbook and are applied prior to any additional penalties incurred under the provision of section 1 of the present Conventions.

(5) *Marking Industrial Visits*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visits Academic Organiser on a good / satisfactory / non-satisfactory basis, and are allocated a total of 20 marks. Guidance on the requirements for the reports is provided at the annual 'Introduction to Industrial Visits' talk. Formative feedback is provided on the first of the four reports.

(6) *Marking the Team Design Project*

The team design project is double marked, blind, by two of the Part I Examiners. They then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each project and each team member. Supervisors of the projects submit a written report to the examiners on the work carried out by their teams and these are taken into consideration when the examiners decide the final agreed marks. Industrial representatives may be asked to contribute to the assessment process. The project is allocated 50 marks, of which 25 are for the written report and 25 for the oral presentation. The same two examiners assess both the reports and the presentations. Guidance on the requirements for the report and an outline marking scheme are provided in the 'Team Design Projects Briefing Note' published on the Teaching pages of the Oxford Materials website.

(7) *Marking the 4th Year Management Project*

The management project is allocated 200 marks and is marked by the Saïd Business School.

The projects are assessed and graded independently by two Assessors. The supervisor's comments on the performance of the candidate are provided to the Assessors. The marks provided by the Assessors are moderated by an Examiner, and the final mark is ratified by the Board of Examiners.

The process is:

- Supervisors provide a report on the performance of the student, indicating any special circumstances that could have affected the student's performance on the project and report preparation.
- The project reports are graded blind by two Assessors, taking account of the Supervisor's comments. At least one of the Assessors will have knowledge of the area of the project.
- The Supervisor's report, and Assessors' reports and marks are provided to an Examiner, who moderates the marks and provides a final mark for ratification by the Board of Examiners.
- Supervisors may not act as Assessor or Examiner for a project they have supervised.
- An Assessor may also act as Examiner for a project. The Assessor should assess and mark the report before having sight of the other Assessor's report and marks.

3. CLASSIFICATION & MARKING CRITERIA

The following boundaries (CVCP) and descriptors (MPLSD) are used as guidelines:

Class I Honours 70 – 100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
Class Ii Honours 60 – 69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
Class Iiii Honours 50 – 59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
Class III Honours 40 - 49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
Pass 30 - 39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
Fail 0 - 29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary only.

In borderline cases the examiners use their discretion and consider the overall quality of the work the candidate has presented for examination. The external examiners often play a key role in such cases.

Part I:

Unclassified Honours – The examiners are required to classify each candidate according to her/his overall average mark in Part I as (a) worthy of Honours, (b) Pass or (c) Fail. A candidate is allowed to proceed to Part II only if he/she has been adjudged worthy of honours by the examiners in Part I. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks. Candidates adjudged worthy of honours normally proceed to Part II but they may, if they wish and subject to approval from the relevant bodies, leave after Part I in which case an Unclassified Honours B.A. degree will be awarded.

Pass – The examiners consider that the candidate is not worthy of honours and therefore will not be allowed to proceed to Part II. The candidate may leave with a B.A. (without honours) or may retake Part I the following year (subject to college approval).

Fail – The examiners consider that the candidate is not worthy of a B.A. The candidate either leaves without a degree or may retake Part I the following year (subject to college approval).

Part II:

Classified Honours – Once marking is completed for both Parts I and II an overall percentage mark is computed for each candidate and classification then takes place. Subject to the requirement that Part II be adjudged worthy of honours (see below), classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is only taken into account in borderline cases. However, a candidate cannot be awarded an M.Eng. degree unless his/her performance in Part II is adjudged worthy of honours i.e. a candidate must be adjudged worthy of honours both in Part I and in Part II to be awarded the M.Eng. degree. Failure to achieve honours in Part II will result in the candidate leaving with an unclassified B.A. (Hons) irrespective of the aggregate mark.

Pass – Notwithstanding the award of unclassified honours in Part I, the examiners consider that the candidate’s overall performance is not worthy of an M.Eng. The candidate is listed as a Pass on the class list and is awarded an unclassified B.A. (Hons) on the basis of Part I performance.

Fail – The examiners consider that the candidate’s overall performance is not worthy of an M.Eng. *and* that the performance in Part II is not worthy of a Pass. The candidate is excluded from the class list but is nevertheless awarded an unclassified B.A. (Hons) on the basis of Part I performance.

- The examiners cannot award unclassified honours on the basis of Part II performance unless permitted to do so by the Proctors.
- Nevertheless, candidates awarded a Pass or a Fail by the Part II examiners leave with an unclassified B.A. (Hons) because they were judged worthy of that in Part I (i.e. their degree is the same as if they had left immediately after Part I).
- In terms of the degree awarded, there is no difference between a Pass and a Fail in Part II. The only difference is whether or not the name appears on the class list.
- Candidates cannot normally retake Part II because the Examination Regulations require that they must pass Part II within one year of passing Part I. This rule can be waived only in exceptional circumstances, with permission from the Education Committee.

Annex: Summary of marks awarded for different components of the MEM Final Examination in 2016 (For Part I and Part II students who embarked on the FHS respectively in 2014/15 and 2013/14)

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Introductory Economics (Ec1)	100
	General Management	100
	Microeconomics	100
	Practicals & Industrial visits	70
	Team Design Project	50
<i>Part I Total</i>		<i>820</i>
Part II	Management Project	200
	Materials Options Paper 2	100
	One paper from a choice of Economics and Management Papers.	100
<i>Part II Total</i>		<i>400</i>
<i>Overall Total</i>		<i>1220</i>

Annex to the Materials, Economics & Management Examination Conventions for 2015/16

[Extract from E&M Conventions relating to the marking of Economics & Management Papers]

3.2.1 Marking Criteria

Examination scripts are normally marked by first assigning a mark between 0 and 100 *for each question*. For essay questions, *step-marking* is used – which means that if, for example, the marker judges an essay to be of “high 2.1” standard, then it is awarded the corresponding mark, 68, from the table below. The guidance for economics markers in 2012 was as follows:

1. Essay questions

Essay questions are marked on the 17-point scale below.

Scale for Essay Questions		
First Class	Excellent 1 st	93
	High 1 st	85
	Mid 1 st	78
	Low 1 st	73
Upper Second	High 2.1	68
	Mid 2.1	65
	Low 2.1	62
Lower Second	High 2.2	58
	Mid 2.2	55
	Low 2.2	52
Third	High 3 rd	48
	Mid 3 rd	45
	Low 3 rd	42
Pass	Pass (High Fail in Prelims)	35
Fail	Fail	25
	Low Fail	12
Zero	Zero	0

See 3.2.2 below for a detailed description

2. Problem and short questions

Problem questions and other questions consisting of several parts with short answers, where specific answers are expected, will be marked using the full percentage scale.

See 3.2.3 below for a detailed description

3. Theses

Theses in Economics or Management will be given an overall mark on the 17-point scale used for essay questions

4. Overall marks for a script

The overall mark for the script will be the appropriately weighted average of the marks for individual questions.

3.2.2 Marking Criteria for Essay Questions in Economics and Management

Markers will look for the following qualities in economics essays:

1. **Command of Material:** secure knowledge and understanding of relevant concepts, models and evidence; incisive explanation and economic insight; evidence of wide reading.
2. **Analysis:** Well-focused and analytical approach, addressing the question directly; coherent and cogent argument and discussion.
3. **Exposition:** Efficient, organised; and structured; well-written and fluent; interesting and pleasant to read.
4. **Judgement:** Perceptive appreciation of implications of formal models; well-judged application of theory and use of illustrative examples.
5. **Independence:** Evidence of independent thinking and insight in approach to the question, explanation of concepts, or application or interpretation of models.

The following table provides a guide to the expected level of achievement corresponding to each class, and step-mark.

First Class (70-100)	An analytical and well-written essay, demonstrating excellent command of material, breadth of knowledge, cogent argument, good judgement and independent insight.	Outstanding and thought-provoking; evidence of deep critical understanding, novel ideas and originality of approach.	Excellent 1 st	93
		Comprehensive; highly analytical; knowledgeable and elegantly written; strong evidence of independent insight.	High 1 st	85
		Clear, thorough, well-focused and well-argued. Secure command of material showing independent thought; no significant mistakes or misunderstanding.	Mid 1 st	78
		An essay demonstrating many first-class qualities, but with identifiable gaps, occasional misinterpretation or small mistakes, will be given this mark.	Low 1 st	73
Upper Second (60 – 69)	A structured and well-written essay addressing the question; good command of the relevant core material; clear explanations and arguments, and evident understanding.	Thoughtful and well-argued; analytical approach; secure understanding and explanation. But lacking the breadth, judgement or independence of a 1 st class essay. Or an otherwise 1 st class essay marred by a significant deficiency.	High 2.1	68
		Competent essay making good use of relevant material. Careful explanations and arguments. May contain some gaps or mistakes, or occasional confusion or lack of focus.	Mid 2.1	65
		A generally competent essay, but more limited with respect to coverage of material, clarity of explanation, or economic insight; or relying on textbook or lecture material without independent judgement. Mostly well-written but may include some confused or less well-focused sections, or a significant mistake.	Low 2.1	62

Lower Second (50 – 59)	Reasonably well-written essay, relevant to the question and making use of appropriate material, showing understanding of essential concepts. But limited in scope or with notable deficiencies of analysis or exposition.	Focused on the question; showing knowledge and understanding of core material. Including valid arguments and effective explanation, but lacking a secure grasp of the topic, or with important gaps in coverage.	High 2.2	58
		Relying on limited material, or with significant mistakes in interpretation or explanation of relevant material. Or: a well-constructed essay that fails to address the question asked; or an otherwise very good answer that is significantly unfinished.	Mid 2.2	55
		Relevant in broad terms to the question, including relevant material and attempting to construct arguments. Poorly written, some misunderstanding and confusion, and/or very limited coverage.	Low 2.2	52
Third (40 – 49)	Achieves a minimal response to the question, revealing some basic knowledge of core material. Some attempt to provide structure and argument. But very limited coverage and/or serious inaccuracy and evident confusion.	Some evidence of understanding, insight and thoughtfulness; some attempt to link the material used to the question. But poor explanations or inadequate exposition; large parts or the answer irrelevant, confused or making no substantive contribution.	High 3 rd	48
		Showing knowledge of material that is at least marginally relevant, but little sign of deeper thought or understanding. Very poor exposition; no successful analysis. Or, a better essay that completely misses the point of the question.	Mid 3 rd	45
		A very poorly written and confused essay, or a very short one, showing little evidence of understanding.	Low 3 rd	42
Pass 35	A very poor or short answer that nevertheless demonstrates some grasp of material that can be interpreted as addressing the question asked, and an attempt to organise it appropriately.	Pass (High Fail in Prelims)	35	
Fail 25	Containing some relevant information and evidence of having understood the question, either as part of a confused and badly-written essay, or in an answer that is not presented in essay form (for example, an answer presented in bullet points or one that progresses no further than an introductory section).	Fail	25	
Low Fail 12	A minimal answer, containing some evidence of knowledge of related topics or interpretation of the question.	Low Fail	12	
Zero	No meaningful answer.	Zero	0	

3.2.3 Marking Criteria for Problem-Solving Questions in Economics and Management

80 – 100	<ul style="list-style-type: none"> • Full, clear, accurate answer, well-presented and well-explained, including appropriate interpretation or application • Some exceptional qualities: either in the insight shown or the sophistication of the approach • No more than minor mistakes; faultless answers may be given 100%
70 – 79	<ul style="list-style-type: none"> • Accurate, clear and methodical; correct in all important respects • Good explanation of the approach and the steps in the solution • Showing awareness of interpretation or application
60 – 69	<ul style="list-style-type: none"> • Appropriate choice of approach, and corresponding explanation • Successful completion of significant steps; accurate use of notation • Evidence of thinking about the meaning of answers and awareness if they don't seem sensible
50 – 59	<ul style="list-style-type: none"> • Evidence of understanding of the question and standard techniques • Systematic approach; some success in deriving a solution, even if marred by carelessness or significant mistakes • Some attempt to explain and justify working
40 – 49	<ul style="list-style-type: none"> • Displaying relevant knowledge or competence • Attempt to apply a reasonable approach and use the information provided in the question in a systematic way • Serious mistakes or confusion; inadequate or inaccurate explanations
30 – 39	<ul style="list-style-type: none"> • Evidence of some competence or knowledge of a possible approach • Little or no systematic analysis • Absence of explanation, or obvious confusion or lack of understanding
0 – 30	<ul style="list-style-type: none"> • Very little evidence of relevant knowledge or understanding • No attempt to apply a systematic approach • Serious confusion in interpretation of the question

Questions involving several parts with marks weightings

Parts of the question involving problem-solving will be marked according to the criteria above. Parts requiring description, explanation and/or illustration of concepts or models will be marked by applying the basic criteria for essay questions. The overall mark will normally be the appropriately weighted sum, but markers will use discretion where it is required to give candidates credit for the quality of the answer as a whole: for example, if some of the answer to one part of a question is given in answer to another part.

3.3 Verification and reconciliation of marks

All subjects are double blind marked, with both initial marks being reported to the Secretary. After recording their initial marks markers are required to meet with their co-marker and reach an *agreed mark*. Agreed marks are reported to the Secretary, and supersede initial marks.

If the markers cannot reach an agreed mark they may instead assign revised marks, which must not lie outside the range of the two initial marks. They may confirm their original mark. Revised marks are reported to the Secretary, and supersede initial marks. At the same time, markers must submit an explanation of the reasons for their inability to agree a mark, and this will be made available to the Examiners.

MATERIALS EXTERNAL EXAMINERS' REPORTS

Title of Examination(s):		Materials Science
External Examiner Details	Title:	Professor
	Name:	M. Grace Burke
	Position:	Director, Materials Performance Centre
	Home Institution:	University of Manchester

Please complete both Parts A and B.

Part A					
		<i>Please (✓) as applicable*</i>	Yes	No	N/A / Other
A1.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?		✓		
A2.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?		✓		
A3.	Do the threshold standards for the programme appropriately reflect the frameworks for higher education qualifications and any applicable subject benchmark statement? <i>[Please refer to paragraph 3(b) of the Guidelines for External Examiner Reports].</i>		✓		
A4.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?		✓		
A5.	Is the assessment process conducted in line with the University's policies and regulations?		✓		
A6.	Did you receive a written response to your previous report?		✓		
A7.	Are you satisfied that comments in your previous report have been properly considered, and where applicable, acted upon?		✓		
<p>* If you answer "No" to any question, please provide further comments in Part B. Further comments may also be given in Part B, if desired, if you answer "Yes" or "N/A / Other".</p>					

Part B

B1. Academic standards

- a. *How do academic standards achieved by the students compare with those achieved by students at other higher education institutions of which you have experience?*

The academic standards achieved by the students are impressive, and compare extremely well with and generally exceed the levels attained by students at other higher education institutions. The high academic standards of the department are reflected in the comprehensive and rigorous examination papers, and in the curriculum, which is supplemented by laboratory practicals and projects.

- b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

This examination included students completing the Material M Eng programme, and three students from the Materials/Economics/Management M Eng programme. For the most part, the academic performance of the students exceeds that of students at other universities. It was noted that two students in Part I did not achieve the required standards for honours, one of whom will be able to resit the examination. As an external examiner, I reviewed the examination papers for those students, and concurred with the conclusions of the internal examiners. Also, one M Eng student did not achieve the required standard in Part II and did not attain MEng Hons. As this thesis project was in an area in which I have considerable experience, I fully concurred with the Internal Examiners.

B2. Rigour and conduct of the assessment process

Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University's regulations and guidance.

The assessment process, which involved the rigorous examination papers, the Part II theses, project reports and laboratory assignments/reports, provides an excellent opportunity for the students' performance to be carefully evaluated. In particular, the Part II viva examination provides each student with the additional opportunity to demonstrate their knowledge gained from independent research projects. The depth of understanding as well as the initiative shown by numerous students was most impressive.

I further observed that the assessment process in the Department of Materials was conducted extremely carefully and fairly, with serious deliberation amongst all examiners to ensure that the very high quality and standards of the Department and University were maintained. As an external examiner, I was able to provide an independent external view of various Part II theses. I was impressed with the deliberations and the fairness of the process.

B3. Issues

Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University?

During the 2015 and 2016 examination panels in the Department of Materials the process for handling the Factors Affecting Performance / extenuating circumstances applications has changed so that the Department must deal with these issues, without the ability to require corroborating evidence from Colleges or Proctors to independently validate the student petition. Thus, an excessive amount of time is expended by the examination committee dealing with these applications. I have witnessed the extremely careful and thoughtful deliberations of the examiners in their analysis of these applications. As I have been exceptionally impressed by the rigour and fairness of the Examination processes within the Department (and University), I would suggest that this process (evaluation of extenuating circumstances) be re-examined in the hope that a process in which evidence from the Colleges as well as the Proctors in addition to the student application can be obtained, and that the decisions for granting approval are made at the University level rather than at the Departmental level.

B4. Good practice and enhancement opportunities

*Please comment/provide recommendations on any **good practice and innovation relating to learning, teaching and assessment**, and any **opportunities to enhance the quality of the learning opportunities** provided to students that should be noted and disseminated more widely as appropriate.*

I have found that the quality of the curriculum is outstanding, and that a broad range of learning opportunities, from lectures, tutorials, laboratory practicals, group projects, technical visits and the Part II project enable the graduates of the Department of Materials to be exceptionally well-prepared and well-qualified.

B5. Any other comments

Please provide any other comments you may have about any aspect of the examination process. Please also use this space to address any issues specifically required by any applicable professional body. If your term of office is now concluded, please provide an overview here.

I commend the Department of Materials for their forward-looking approach and for their willingness to incorporate all the suggestions made over the four years of my tenure on the examining committee. Furthermore, I have been extremely impressed with the professionalism, organisation and execution of the Part II vivas and examination committee meetings. It is clear that significant effort is expended in the preparation of all materials (student coursework, examinations, reports, etc.). I commend the Department of Materials Staff and internal examiners for their outstanding work.

As I have noted in Section B3, it is important that the process for handling the applications for Factors Affecting Performance / extenuating circumstances be reassessed. The Department is now responsible for this process, without the ability to request corroborating evidence needed for a fair assessment of the FAP applications. This would be most effectively handled at the University level rather than on a Departmental level, and would relieve this additional burden on the Department Examiners.

Signature:	M.G Burke
Date:	26 July 2016
<p>Please email your completed form (preferably as a word document attachment) to: external-examiners@admin.ox.ac.uk and copied to the applicable divisional contact. Alternatively, please return a copy by post to: The Vice-Chancellor c/o Catherine Whalley, Head of Education Planning & Quality Review, Education Policy Support, University Offices, Wellington Square, Oxford OX1 2JD.</p>	

EXTERNAL EXAMINER REPORT FORM 2016



Title of Examination(s):		Materials Science
External Examiner Details	Title:	Prof
	Name:	Mike Reece
	Position:	
	Home Institution:	Queen Mary University of London

Please complete both Parts A and B.

Part A					
		<i>Please (✓) as applicable*</i>	Yes	No	N/A / Other
A1.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	✓			
A2.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?	✓			
A3.	Do the threshold standards for the programme appropriately reflect the frameworks for higher education qualifications and any applicable subject benchmark statement? <i>[Please refer to paragraph 3(b) of the Guidelines for External Examiner Reports].</i>	✓			
A4.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	✓			
A5.	Is the assessment process conducted in line with the University's policies and regulations?	✓			
A6.	Did you receive a written response to your previous report?	✓			
A7.	Are you satisfied that comments in your previous report have been properly considered, and where applicable, acted upon?	✓			
<p>* If you answer "No" to any question, please provide further comments in Part B. Further comments may also be given in Part B, if desired, if you answer "Yes" or "N/A / Other".</p>					

Part B

B1. Academic standards

- a. *How do academic standards achieved by the students compare with those achieved by students at other higher education institutions of which you have experience?*

The majority of the students demonstrated high academic standards as evidenced by their coursework (broad range of activities), examination scripts and project report and viva. They compare very favourably with other institutes.

- b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

The majority of the students were on the Materials Meng programme. There were a few students (one part I and two part II) on the Materials Economics and Management Programme. The marks for the students on the Materials Meng programme are good with the exception of those of two students at Part I who did not achieve the required standard for honours: one of them can either re-enter Part I or take BA (pass), and the other one can take a BA (pass) – having already re-entered Part I. There was one student at Part II who could take a BA Honours (unclassified) having achieved a mark worthy of honours in Part I but not Part II. The few students on the Materials Economics and Management programme (parts I and II) have good marks.

B2. Rigour and conduct of the assessment process

Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University's regulations and guidance.

The examination process from the writing of the papers through to the final exam board was thoroughly and fairly run. The papers were well written and challenging. I was, like last year, very impressed by the rigour of the assessment of the part II reports and the conduct of the part II vivas. This was done in a way that was conducive to revealing the ability and knowledge of the students. The administration of the examination process was very professional. The examination board was very accurate and objective.

B3. Issues

Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University?

See below.

B4. Good practice and enhancement opportunities

Please comment/provide recommendations on any good practice and innovation relating to learning, teaching and assessment, and any opportunities to enhance the quality of the learning opportunities provided to students that should be noted and disseminated more widely as appropriate.



The programmes are well tried and tested and deliver an excellent education. The part II projects are of particular note because of the intensive research experience that they provide to the students. At the end of the vivas the students unanimously commented on how much they had enjoyed the experience.

B5. Any other comments

The process for dealing with extenuating circumstances is unsatisfactory. I commented on this last year. I have received a response from the university, but nothing has been progressed on this issue. The problem is that exam board does not receive sufficient information on which to make a sound judgement on the validity and severity of the FAPs.

Please provide any other comments you may have about any aspect of the examination process. Please also use this space to address any issues specifically required by any applicable professional body. If your term of office is now concluded, please provide an overview here.

Signature:	<i>Mike Reece</i>
Date:	11.07.16
<p>Please email your completed form (preferably as a word document attachment) to: external-examiners@admin.ox.ac.uk and copied to the applicable divisional contact.</p> <p>Alternatively, please return a copy by post to: The Vice-Chancellor c/o Catherine Whalley, Head of Education Planning & Quality Review, Education Policy Support, University Offices, Wellington Square, Oxford OX1 2JD.</p>	

**Faculty of Materials
Department of Materials Academic Committee**

RESPONSE TO EXAMINERS' REPORTS 2016

Honour School of Materials Science (MS) Parts I & II

Honour School of Materials, Economics & Management (MEM) Parts I & II – Materials elements only, main response will be made by the E(M)EM Standing Committee

The External Examiners' reports, the FHS Chairperson's report and internal reports on all of the individual Materials papers, FHS and prelims, were considered by the Department of Materials Academic Committee (DMAC) and were reported to the Faculty of Materials. The Prelims Chairperson's report was considered by the Chairman of DMAC.

1. Summary of major points

There were no major issues arising from the 2016 Examinations.

However there was continuing great and unanimous concern among the Materials internal and external examiners over the new arrangements for dealing with Factors Affecting Performance. The FHS Chairperson has written in detail on this issue to Division and her report for the MS Part I summarises the concerns very clearly. These concerns are again raised explicitly by the External Examiners, one of whom records dissatisfaction with the response he received from the University on this issue in 2015. Division and EdC are asked to consider these very carefully.

2. Points for inclusion in Responses to the External Examiners

MS & MEM Parts I & II: Professor MG Burke

We thank Professor Burke for her very positive report and the time and effort devoted to her role as an External Examiner, not least in the substantial task of examining the Part II MS theses.

The Department continues to share the concerns of its examiners on the new FAP procedures and will take forward with the Division discussions on this matter.

Finally, our sincere thanks to Professor Burke for her sterling service as one of our External Examiners for the last four years.

MS & MEM Parts I & II: Professor M.J. Reece

We thank Professor Reece for his very positive report and the time and effort devoted to his role as an External Examiner, not least in the substantial task of examining the Part II MS theses.

The Department continues to share the concerns of its examiners on the new FAP procedures and will again take forward with the Division discussions on this matter.

MEM Parts I & II, Management Papers: Professor B. MacCarthy

We thank Professor MacCarthy for his positive report and for his careful scrutiny of scripts.

MEM Parts I & II, Economics Papers:

No Report received.

3. Further Points

The suggestions of the Chairman of Prelims in terms of question setting will be discussed at a meeting of the Faculty of Materials, although, in the light of the prior steer given by Faculty to the Examiners regarding Faculty's concern that Prelims marks distributions were not reflective of subsequent performance in FHS written papers, action on these suggestions by the Prelims Moderators would not be expected to be controversial, provided the students and Tutorial Fellows were given early notice of this shift in emphasis of the questions on the Prelims papers.

4. Examination Conventions

We confirm that when updating our Examination Conventions we consider the points in the EdC notes of guidance on Examinations & Assessment, as summarised in the Guidance on Examination Conventions issued by the MPLS Division.

A.O. Taylor, Chairman of DMAC, 1/12/16

E(M)EM Standing Committee

Reports from the External Examiners for the Economics & Management Components of MEM Part I & II

Title of Examination(s):		Economics and Management; Engineering, Economics & Management; Materials, Economics & Management.
External Examiner Details	Title:	Professor
	Name:	Bart MacCarthy
	Position:	Professor of Operations Management
	Home Institution:	University of Nottingham

Please complete both Parts A and B.

Part A					
		<i>Please (✓) as applicable*</i>	Yes	No	N/A / Other
A1.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?		✓		
A2.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?		✓		
A3.	Do the threshold standards for the programme appropriately reflect the frameworks for higher education qualifications and any applicable subject benchmark statement? <i>[Please refer to paragraph 3(b) of the Guidelines for External Examiner Reports].</i>		✓		
A4.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?		✓		
A5.	Is the assessment process conducted in line with the University's policies and regulations?		✓		
A6.	Did you receive a written response to your previous report?		✓		

A7.	Are you satisfied that comments in your previous report have been properly considered, and where applicable, acted upon?	✓		
<p>* If you answer “No” to any question, please provide further comments in Part B. Further comments may also be given in Part B, if desired, if you answer “Yes” or “N/A / Other”.</p>				

Part B

B1. Academic standards

- c. *How do academic standards achieved by the students compare with those achieved by students at other higher education institutions of which you have experience?*

Overall the standards are high and compare favourably with other leading Institutions offering undergraduate programmes in business and management. In particular for the management subjects, most students demonstrated some familiarity with key literature sources and the best candidates showed a wide appreciation of key concepts and related literature.

- d. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

Student performance was impressive with only a very small proportion of candidates in the lower half of the 2:2 class. A number of candidates showed exemplary performance across a wide range of business and management subjects and merited their first class awards.

B2. Rigour and conduct of the assessment process

Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University’s regulations and guidance.

All papers were marked independently by two markers and an agreed final mark recorded. It would be helpful if both first and second marker marks were recorded on the spreadsheets per question accompanying the scripts. This was the case for most but not all papers.

B3. Issues

Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University?

No.

B4. Good practice and enhancement opportunities

*Please comment/provide recommendations on any **good practice and innovation relating to learning, teaching and assessment**, and any **opportunities to enhance the quality of the learning opportunities** provided to students that should be noted and disseminated more widely as appropriate.*

The pre-board meeting had done a good job in highlighting issues relating to various candidates' performance, particularly at borderlines for the externals to consider. This was helpful in offering advice where appropriate.

In common with other Institutions, Oxford is seeing an increase in the number of students reporting circumstances that may have adversely affected their performance. These were all recorded carefully for scrutiny by the Externals. Each case was noted and discussed at the Board and appropriate decisions were made as to the likely effect on performance. It may be worth the Exam Board agreeing a standard procedure for dealing with such cases based on the gravity of the case presented, although these should remain as guidelines – there will always be exceptions.

B5. Any other comments

Please provide any other comments you may have about any aspect of the examination process. Please also use this space to address any issues specifically required by any applicable professional body. If your term of office is now concluded, please provide an overview here.

My comments on each of the examination papers were dealt with appropriately. I had noted in my comments that I felt the scale of the challenge was high for the Accounting paper. However the summary performance statistics for candidates that had taken the paper were in line with the other papers and my concerns were allayed.

Overall the Exam Boards were thorough and rigorous in making classification decisions.

Signature:	B L MacCarthy
Date:	8/8/2016
Please email your completed form (preferably as a word document attachment) to: external-examiners@admin.ox.ac.uk and copied to the applicable divisional contact. Alternatively, please return a copy by post to: The Vice-Chancellor c/o Catherine Whalley, Head of Education Planning & Quality Review, Education Policy Support, University Offices, Wellington Square, Oxford OX1 2JD.	

No report received from the Economics External Examiner

Extract from the Minutes of the discussion of Examiners' Reports at the EMEM Standing Committee held on 27th October 2016

STANDING COMMITTEE FOR E(M)EM

Part II - Reserved

- 9.1 MEM Parts I and II (15MT04)
The Materials examiners continue to be concerned with new Factors Affecting Performance (FAP) processes, and this is clearly expressed in their report. Particular concern had been noted about there being no mechanism for obtaining further evidence for cases with the Proctors' Office refusing to provide assistance when requested.
- The Materials Academic Committee was sympathetic to the examiners' concern and had acknowledged this in the response to the external examiners.
- There were no concerns specific to the MEM programme and, as the above noted response addressed the Committee's views, a separate response was not deemed necessary.
- 9.2 Economics & Management Prelims report (15MT05)
No comments.
- 9.3 External Examiners' Reports (15MT04, 15MT06-8)
Reports have been received from Engineering and Materials. The Economics report is outstanding, but being chased hard internally and by Division and will be presented when available.