

CONFIDENTIAL

EXAMINERS' REPORTS 2024 **MATERIALS SCIENCE (MS)**

Internal Examiners' Reports

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REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

Category	Number			Percentage		
	2023/24	2022/23	2021/22	2023/24	2022/23	2021/22
Distinction	5	10	9	12.5	26	20
Pass	30	26	25	75	64	57
Fail	5	4	10	12.5	10	23

Marking of scripts

Scripts are single marked except for borderline cases which are double-marked. In addition, the Chair selected some scripts at random to be double marked to ensure consistency of marking.

B. EXAMINING METHODS AND PROCEDURES

The conventions have been updated recently, and no further changes were made this year. Each Moderator was assigned the responsibility for setting and marking their principal paper, but they were also assigned a second paper from the outset.

The course design has no lecture courses shorter than 8 lectures, and all lecture courses were examined in the 3 Materials papers and 1 Maths paper. Some questions required knowledge from more than one lecture course. This approach is in line with standard practice in Part I examinations. Lecturers were asked to provide draft questions to ensure that the candidates were examined on material presented to this year's cohort. The overall aim for lecturers in setting the difficulty of questions was such that students who achieve a mark of 70% or more "*show excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and are able to use that knowledge innovatively and/or in unfamiliar contexts.*"

Coursework Paper: the coursework paper is made up of 50% from the first year practicals. 25% from the crystallography classes and 25% from the Computing for Materials Science course.

Computing for Materials Science (CMS): The marks were reviewed and approved.

Crystallography coursework: The report from the Senior Demonstrator flagged no specific concerns.

Practicals: The Moderators considered a report from the Practical Class Organiser (PCO) which outlined events throughout the year which may have impacted on the candidates' performance and agreed that any action taken at the time had mitigated this impact.

The Moderators endorsed most of the PCO's recommended penalties as laid out in their report, but mitigated some where the degree of lateness was very marginal.

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.

No changes

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

Circulation by Senior Education Officer to all students and tutors by e-mail and published to the Departmental website.

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

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

40 students were registered for the examination. All candidates took the same papers for the whole examination in Trinity Term.

34 candidates passed all papers without the need for any compensation. Under the conventions, 1 further candidate was awarded a compensated pass in the Maths paper. Of the successful candidates in Trinity Term.

5 were awarded Distinctions, which recognise especially strong overall performance. All those awarded had total rounded average marks above 75% and had clearly distinguished themselves from the rest of the cohort.

5 candidates failed at least one paper, and all of these took the Long Vacation resits in September.

The prize for the best overall performance in Prelims was awarded to Yilin Ren, St Catherine's College. The Prize for the best performance in 1st year Practicals was awarded to Xinning Feng, Mansfield. The Armourers and Brasiers' Company / Rolls Royce Prize for outstanding overall performance in Prelims was Veronica Zeng, St Catherine's College.

Long Vacation examinations

In the Long Vacation examinations, 4 candidates passed the papers they were resitting. One candidate failed to achieve a passing mark on the Maths paper however due to their submitted MCE it was decided that they would be able to process.

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

Where approved by the Proctors, 3 candidates were allowed (i) extra time on account of dyslexia / dyspraxia, and/or (ii) other special arrangements.

Gender Issues:

Of the 40 candidates 17 were women and 23 men.

3 of the 5 distinctions were awarded to women.

The 2024 mean score showed no obvious gender bias: males 64.9% and females 66.6%.

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

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

This information is in the paper summaries attached.

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

There were 3 applications for special arrangements for the written papers:



Mitigating circumstances

There were six applications to consider regarding Mitigating Circumstances: Notices to Examiners. These were graded, one level 3 and three level 2, and 2 level 2 and the potential impacts on the candidate considered by the Moderators.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Professor A. Wilkinson
Professor T J Marrow (Chair)
Professor A.I. Kirkland
Dr E. Liotti

MS1 – Physical Foundations of Materials

Examiner: Prof. Angus Kirkland

Candidates: 39

Mean mark: 59.53

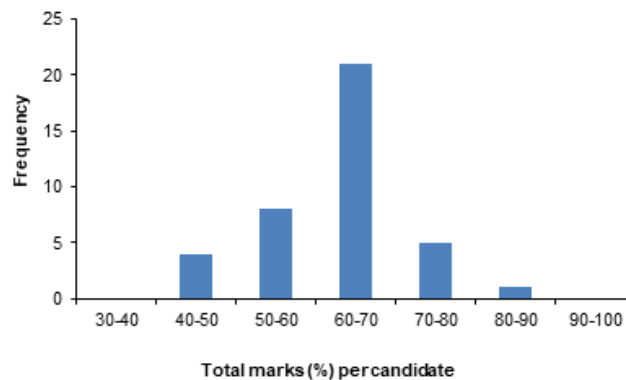
Maximum mark: 82

Minimum mark: 41

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	3	6.67	10	3
2	37	14.65	20	7
3	34	12.44	19	6
4	36	11.67	17	6
5	5	8	12	3
6	3	10.67	14	8
7	39	11.46	14	7
8	37	12.35	16	7

Prelims 2023/24
Materials Science 1



General comments:

Specific Comments:

1. A question with only three attempted answers all so it is impossible to draw any meaningful statistics. No candidate progressed to attempt the final part of this question.
2. A very popular question attempted by almost all candidates with an above average mean mark. Candidates scored well on the first four parts which were largely bookwork, but marks were lost on the final section. The paper as printed contained an error in that part g was duplicated as part h and the moderators agreed to scale the marks to account for this.
3. A popular question attempted by almost all candidates. Parts a and b were well answered but few candidates were able to identify the correct magnetism in part c (i) nor to sketch the magnetic field behaviour as required in c (ii).
4. A popular question that was generally well answered, although many candidates were unable to attempt part c.
5. A question only attempted by five candidates the statistics are limited. Marks were low with only one candidate making any real progress beyond part a.
6. Only three attempts with no high marks. Candidates were unable to derive the expression for the interference wave and there were lots of algebraic errors in part c.
7. A very popular question but with few high scoring answers. Many candidates made numerical errors in their answers to part a and there was a general confusion between crystal and point group symmetry.
8. A popular and generally well answered question. Parts b and c were well answered, in general but many candidates struggled to calculate the lattice parameters required in part a.

MS2 – Structure and Mechanical Properties of Materials

Examiner: Prof. James Marrow

Candidates: 40

Mean mark: 74.85

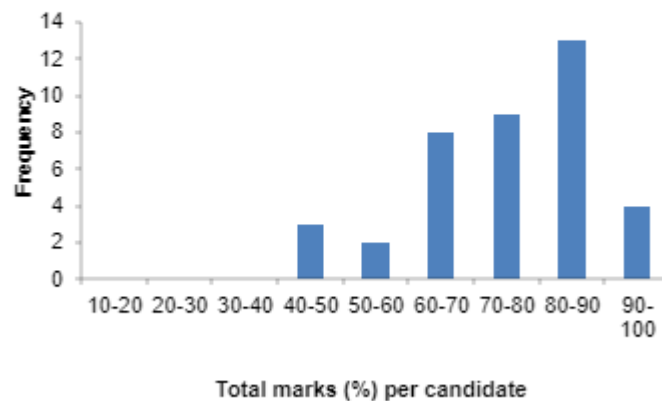
Maximum mark: 92

Minimum mark: 41

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	38	17.55	20	7
2	38	17.51	20	10
3	17	11.89	20	3
4	21	13.55	20	5
5	22	14.68	20	7
6	24	13.76	19	5
7	22	14.00	19	5
8	13	14.00	18	1

Prelims 2023/24
Materials Science 2



General comments:

1: Common errors included: a) incorrect descriptions of dislocations as point or planar defects, b) failure to use the line tension of the dislocation to estimate its energy, c) inadequate explanation of why there is a stacking fault, why it has an associated energy and why the partial dislocations repel each other, d) lack of detail on line and burgers vector of the Lomer-Cottrell lock to explain its behaviour, and e) citing mechanisms that did not actually cause work-hardening.

2: Common errors included: a) incorrect explanation of colour centre and e) answers that did not consider how the grain boundary structure would affect the migration and formation energies. Parts b) to d) were very well answered.

3: a) most correctly determined the linear and turning forces, but b) quite a few provided completely incorrect shear force and bending moment diagrams for this simple beam. In c) most correctly derived the slope and displacement expressions from first principles, but quite a few were unable to start the derivation or became quickly lost, and in d) those that did not recognise that the beam would not curve between points B and C (where there is not force applied) were unable to obtain the correct solution.

4: a) Almost all gave sufficiently clear descriptions of the Mohr's circle construction. Those who did not apply the construction properly were unable to obtain the coordinates of b) its centre or c) its radius. The calculation of the stresses in c) required use of the 2D relationships between stress and strain. Some incorrectly applied the 1D relationship (e.g. as used for uniaxial tensile test) which then also led to inability to correctly answer part e), or made algebraic errors after correctly setting up the 2D equations.

5: In a) i) to iii) the main errors were very inaccurate measurement and calculation and in iv) some were unable to apply Diehl's rule. In b) the main error was omitting the lack of significant work hardening for single slip. In c) quite a few did not understand that FCC crystals do not have a brittle/ductile transition.

6: In a) and b) most wrote down expressions that gave the correct equations for hoop and axial stresses, but quite a few made errors in their orientation with respect to the cylindrical shape and the consequent effect on failure, which showed a lack of understanding (and perhaps limited experience of cooking sausages?). In c) yield stress was generally well defined, but quite a few confused fracture toughness with fracture stress and so gave poor definitions. In d) the calculation was well done by those who correctly considered the stress intensity factor of the crack due to the stress in the wall of the vessel (which is not the yield stress). In e) most descriptions of the role of the MWCTs omitted the possible contribution of 'pull-out', and in e) quite a few offered unsuitable mechanisms that required changes in chemistry or composition, or incorrectly invoked changes in temperature.

7: Most did a fair job of identifying the planes (some neglected all planes due to symmetry), but many produced quite inaccurate sketches of the stereographic projections (particularly the angles between poles, even when calculated correctly) or did not calculate these angles.

8: a) Some were quite confused about the definitions of primary and intermediate solutions and did not provide suitable phase diagrams to identify these. Part b) was well answered by most with no common errors, as were c) and d) though some did not describe the classes of intermediate phases. In e) quite a few of the descriptions of superlattices were confused and showed a lack of understanding of their structures or how and why they are formed.

MS3 – Transforming Materials

Examiner: Dr. Enzo Liotti

Candidates: 40

Mean mark: 62:00

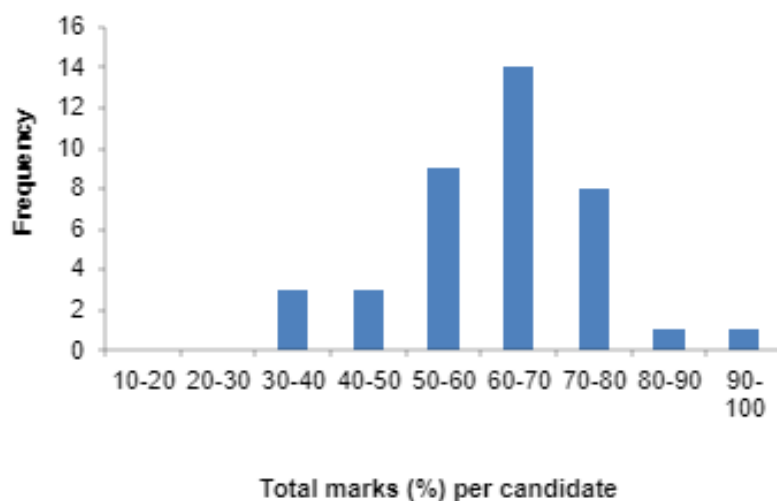
Maximum mark: 90

Minimum mark: 31

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	32	11.22	18	2
2	24	9.5	19	1
3	2	5	8	2
4	12	13.25	18	10
5	29	14.66	20	2
6	33	12.85	20	3
7	30	12.53	19	3
8	37	13.49	19	1

Prelims 2023/24
Materials Science 3



General comments:

Overall, most of the candidates pass the exams with good marks. However, three students did not reach the pass mark. The paper included two questions about electrochemistry (Q1 and 2), two of nanomaterials (Q3 and 4), two Microstructure and processing of materials (Q5 and 6) and two thermodynamics (Q7 and 8). The thermodynamics questions were the most answered, followed by those on microstructure and processing of materials and electrochemistry. The nanomaterials questions were attempted by a much lower number of candidates (only 2 candidates answered Q3).

Specific Comments:

1. Quite a popular question, parts a-e were well answered in general, but most of candidates struggled with parts f and g, only achieving ~30% of the available marks on average.
2. This question was about the Tafel plot, it was less popular than Q1. Most students did a good job in part a, on average gathering 57% of the available marks. However, most of the students did not answer well part b. Overall, the average mark was less than 50%.
3. This question was attempted only by 2 candidates with very poor answers.
4. Not very popular questions, attempted by only 30% of the candidates, but well answered. On average, in part a, b and d the candidates achieved more than 70% of the available marks. They struggled a bit more in part c, which was about 1D nanofibers and nanotubes.
5. Popular questions about phase diagram. Overall, the best answered question. Most of the students demonstrate a good understanding of phase diagram with only a few minor conceptual mistakes.
6. Very popular question on solidification. Well answered by most of the candidates, main mistakes were on the definition of lower critical solution temperature and cored dendrites. Good understanding of solidification of hypo-eutectic alloys.
7. Popular question generally well answered. Students struggled more on part a of the question on non-ideal solutions, while did a good job on reactions and Ellingham diagram.
8. Most popular question with 93% response rate. Answers were good, although student struggled a bit in part a about ideal gas.

Maths for Materials Science

Examiner: Prof. Angus Wilkinson

Candidates: 39

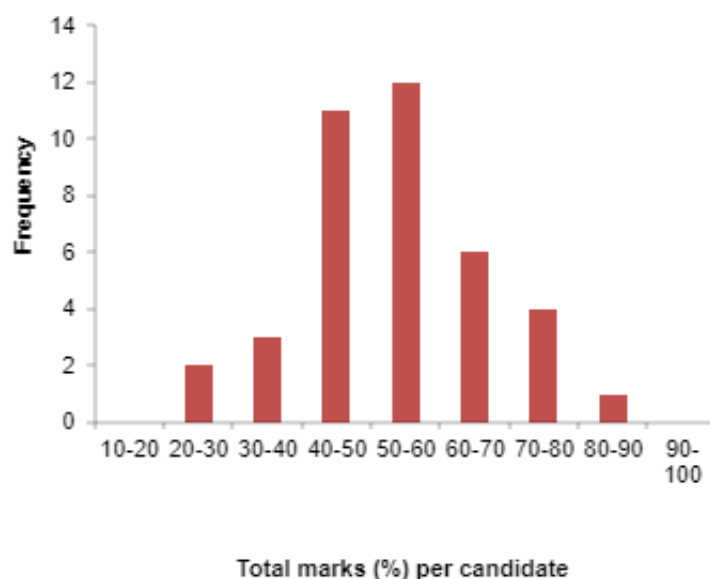
Mean mark: 52.46

Maximum mark: 86

Minimum mark: 28

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	40	3.31	8	0
2	40	1.54	8	0
3	40	3.51	8	0
4	40	7.08	8	0
5	40	2.59	8	0
6	40	4.03	8	0
7	40	2.90	4	0
8	40	7.21	8	3
9	40	6.72	8	3
10	40	6.28	8	0
11	24	8.79	18	1
12	24	7.57	15	1
13	30	13.72	25	1
14	23	10.43	19	1
15	39	15.24	25	7
16	19	11.11	23	5



General comments:

Specific Comments:

Section A:

Short form questions to be answered by all candidates and each marked out of 8.

1. Integration and induction relationships - reasonable attempts at a) in most cases, but the majority failed to see the useful substitution $u^2=x$ in b). Part c) was only attempted by a minority of candidates. Two candidates achieved full marks.
2. Phase difference in RCL circuits. Some basic physics knowledge was needed and this seemed to be lacking in much of the cohort with many skipping the question or giving no meaningful content in their answer. The average mark was very low, though two candidates achieved full marks.
3. A standard question on partial differentiation and chain rule. Many scripts were not careful in noting which variable was held constant and made errors by then selecting the most convenient rather than the correct variable to hold constant. Seven candidates achieved full marks.
4. Simple differentiation and curve sketching including asymptotes. Generally answered very well with many (27) achieving full marks.
5. Differential equation. Most candidates identified that the equation was inexact but then struggled to identify and correctly use an integrating factor. The average mark was low though, two candidates obtained full marks.
6. Taylor series expansions. Part (a) done reasonably well though with arithmetic errors. Part (b) done less well with many writing as $\ln(1+u)$, with $u=3x^2 + 7x + 1$ but not realising that the all terms in expansion then contribute to the constant term $\rightarrow$ no convergence so cannot truncate to first few terms.
7. Limits and L'Hopital's rule. (a) most candidates gave good answers to (a) many gaining full marks. Part (b) contained a typographical error asking for the limit as $x \rightarrow \infty$ when the $x \rightarrow 0$ had been intended. Part (b) was ignored and total mark for paper scaled out of 176, rather 180.
8. Crystallography, miller indices and angles between planes in a cubic system. Answered very well.
9. Eigenvalues and eigenvectors. Question was generally answered well.
10. 3 by 3 matrix inversion. Question was generally answered well.

Section B:

Long form questions with candidates selected to answer four out of the six available questions. Each question was marked out of 25.

11. Integration including reduction formulae and multiple integration. Parts (a) and (b) were answered reasonably well by the majority who attempted this question. All candidates struggled with part (c) with many not understanding how to proceed with the suggested substitution.
12. A question based around the 1-d wave equation and complex refractive index. As with question 2 in section A, the link to some physics was not seen as an attractive point on this question, which was the least popular in section B. The average mark was also the lowest for section B. Part A was generally answered very strongly but beyond this, answers were on the whole very weak.
13. A partial differentiation. Part (a) on chain rule was answered very strongly by all candidates who attempted the question with very few marks dropped. By contrast answers to part B concerning homogeneous functions were on the whole markedly poorer. One candidate obtained full marks for the question.
14. Differential equations and Euler's numerical approximation. The vast majority solved the ODE in part (a) (i), and most did well with applying Euler's method, though many were not sure how to evaluate the true value of $y(0.3)$. In part (b) (i) was easily solved by almost all, but most struggled to see how to begin tackling (ii).
15. This vector geometry question was the most popular of section B and also had the highest average mark. Very few marks were lost across all attempts for part (a) to (d). Many candidates found the construction and use of a rotation matrix more challenging and more marks were lost across parts (e) to (f). One candidate obtained full marks.
16. This question concerned a vector field. Part (a) was answered well, and sketches for (b) were mostly good, though some missed details on the y and x axes. Surprisingly the explanations given for part (c) were often rather weak including from those scoring very highly across more mathematical parts of the question. Parts (d) to (f) seemed to fall in two distinct camps of either very strong answers or those struggling to make any headway.

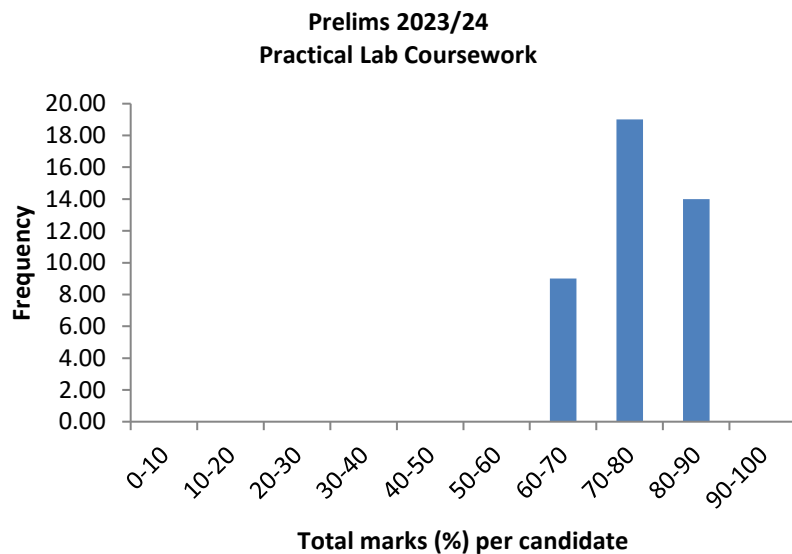
Practical Lab Coursework

Candidates: 40
Mean mark: 75.4%
Maximum mark: 88%
Minimum mark: 60%

Detailed comments on the coursework are as follows:

Lab No			
Lab Book Assessment (/3)	Average Mark	Highest Mark	Lowest Mark
1P3	2.4	3.0	1.0
1P4	2.0	3.0	1.0
1P5	1.9	3.0	1.0
1P6	1.8	3.0	0
1P7	1.5	3.0	0
1P8	2.1	3.0	0
1P9	3	3.0	2.0
1P10		3.0	1.0

Lab No			
Lab Report Assessment (/13)	Average Mark	Highest Mark	Lowest Mark
1P3 (not assessed)	n/a	n/a	n/a
1P5	9.7	12	6.0
1P8	11.2	13.0	7.0



Report on Practical Marks for the Prelims Moderators June 2024

1st year Practicals 2023-24

I have reviewed the marks from the 1st year Practicals 2023-24. Overall the year ran smoothly.

The lab notebooks were assessed for 8 practicals. Out of a maximum of 3 marks, the average was 2.1, very similar to the 2.2 last year. Practicals requiring long reports averaged 10.3 marks out of 13 (79.3%) increasing from 9.6 in 2022-23.

Overall, there was a broad range of total marks ranging from 60 to 87.2%, while last year they ranged from 50 to 90%. The average mark was 73% (vs 72.6% last year). All candidates are therefore deemed to have passed the Practical Classes.

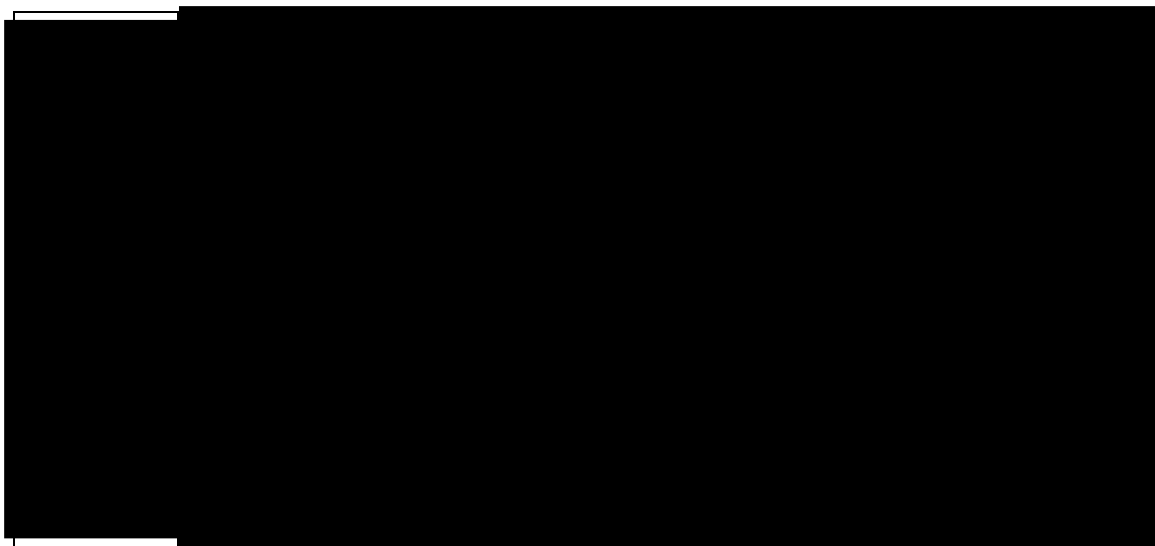
The following should be noted:

- There were seven students who missed practicals due to illness. Medical evidence was received to cover their absence so they were formally excused.

For information:



Report on Practical Marks for the Prelims Moderators June 2024



Penalties to consider:

No penalties to consider this year.

Plagiarism:

Nothing to consider this year.

Problems which occurred in the labs during the course of the year which the Moderators should be aware of as potentially affecting candidates' marks:

None.

Other mitigating circumstances:

None.

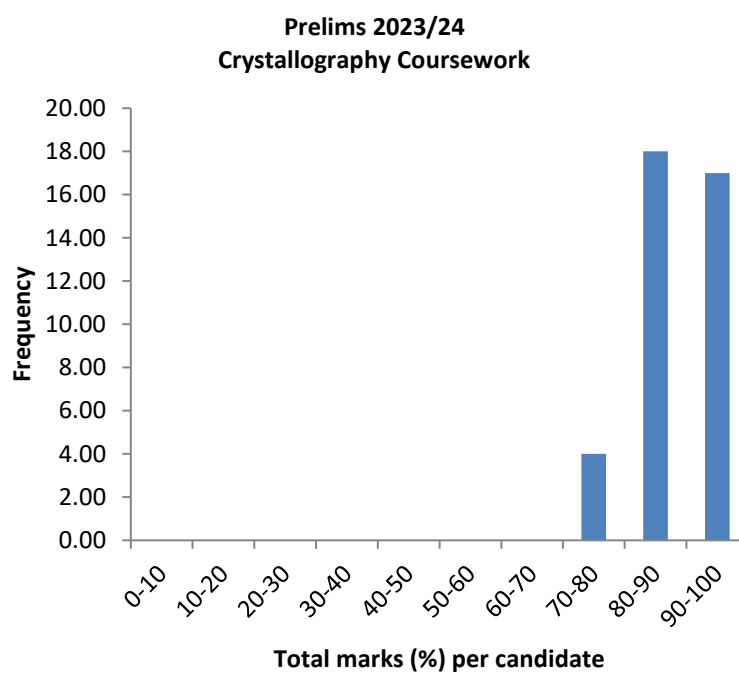
Practical Class Organiser – David Armstrong
June 2024

Crystallography Class Coursework

Candidates: 40
Mean mark: 87.5%
Maximum mark: 96.2%
Minimum mark: 88.1%

Detailed comments on the coursework are as follows:

Demo No	Average Mark	Highest Mark	Lowest Mark
D2	88.5	97.5	38.5
D3	79.6	98.2	21.5
D4	87.6	100	56.3
D5	91.4	100	57
D6	91.9	100	72



Crystallography Marks

As in the previous year, the crystallography classes this year were supervised in person by Dr Ali Mostaed, Dr Alexandra Sheader, Miss Xinrui Huang and Mr Michael Furlan. The four-person team proves to be highly effective in managing the large class size. The demonstrators held an hour-long meeting before each class to review the worksheets for the upcoming session. These meetings were essential to catch and eliminate any typos or errors in the worksheets, ensuring the materials were accurate and clear. Additionally, these meetings provided an opportunity for the demonstrators to discuss and align their understanding of the content, ensuring they will deliver a unified and coherent response to the students during the sessions.

Similar to previous years, the course consists of six classes, with three scheduled in the Michaelmas term and another three in the Hillary term. These classes are designed to support both the Crystallography lectures and Structures of Crystalline and Glassy Materials course, providing a comprehensive learning experience for the students. While the primary focus and structure of each class remain consistent with previous years, slight modifications have been made to the content of the worksheets. These changes are intended to discourage students from relying on previously marked worksheets, therefore, encouraging them to engage more actively with the new material. Additionally, during the sessions, the demonstrators take an active role in engaging with the students. Through their interactions, the demonstrators create an atmosphere where students feel comfortable and encouraged to participate and they also actively invite students to ask questions.

Figure 1 depicts a histogram showing the distribution of students' grades during the 2023/24 academic year. This visual representation allows us to analyze the overall performance and identify trends within the student cohort. Considering the guided nature of the class, as well as the availability of comprehensive lecture notes and textbooks, a practical score of 70% or below suggests that a student encountered difficulties during that specific practical session. These challenges could arise from various factors, such as a lack of understanding of the material or time management issues. Nevertheless, as illustrated in Figure 1, the vast majority of students performed well in their classes, with an average grade of 88% across the entire year group. This high average indicates that most students were able to effectively utilize the resources provided and grasp the practical concepts taught throughout the course. Additionally, it is worth noting that the average grade for the previous academic year was also 88%. This consistency in performance highlights the effectiveness of the instructional methods and the support system in place for the students.

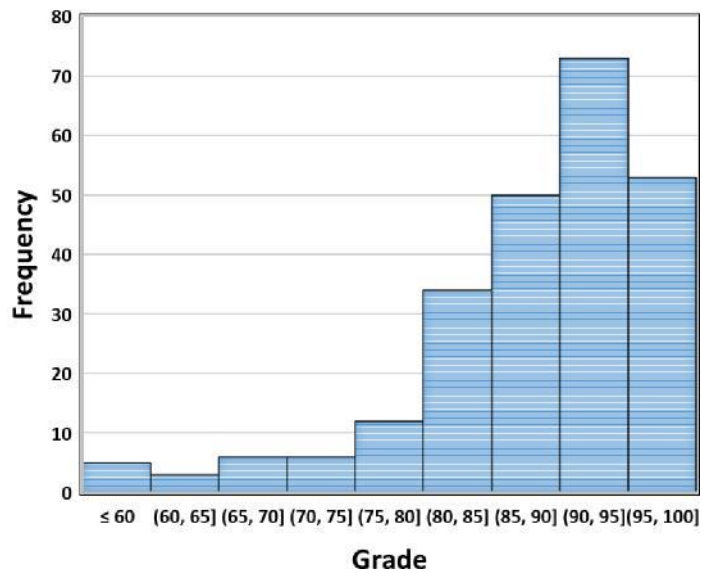


Fig. 1. Histogram representing the grades of the students during the 2023/24 academic year.

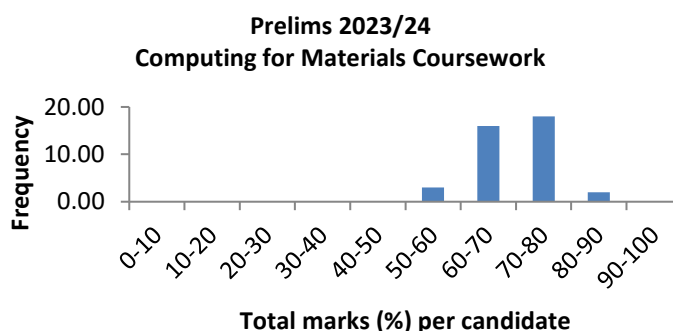
One of the challenges the demonstrators faced in this year's classes was the observation that, on a few occasions, some students were using ChatGPT to answer the questions. The demonstrators actively discouraged students from doing this. The demonstrators also increased their interaction with the students by frequently circulating among each group. This approach was aimed at discouraging students from relying on ChatGPT for answers.

Yours Sincerely,
Ali Mostaed

Computing for Materials Science

Candidates: 40
Mean mark: 67.23%
Maximum mark: 81%
Minimum mark: 55%

Detailed comments on the coursework are as follows:



Report from the 1st year Computing for Materials Science convenor for 2023-24

The classes were held in person, splitting the cohort between two locations. There no technical issues. Support for the assessed projects was provided by a dedicated email address. Very few students took advantage of this.

The quality of reports varied widely. Good reports showed a high degree of scientific insight and curiosity. Weaker reports often presented a few results with little or no analysis. Some students appeared to screenshot figures from Matlab, rather than exporting a figure in a suitable graphics format. This typically means axis labels were very difficult to read. The range of marks came from the differences in writeup, rather than differences in coding skill.

Prof. Jonathan Yates

Professor of Materials Modelling, Dept of Materials, University of Oxford Tutor for Materials Science, St Edmund Hall, Oxford.

Examination Conventions 2023/24

Preliminary Examination in Materials Science

1. INTRODUCTION

Examination conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how examined work will be marked and how the resulting marks will be used to arrive at a final result progression decision and/or classification of an award.

These conventions apply to the Preliminary Examination in Materials Science for the academic year 2023/24. The Department of Materials' Academic (Undergraduate) Committee (DMAC) is responsible for approving the Conventions and considers these annually, in consultation with the examiners. 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 Examination Regulations may be found at: www.admin.ox.ac.uk/examregs.

The paragraphs below indicate the conventions to which the examiners 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 examiners.

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 act on behalf of the University and in this role are independent of the Department, the colleges and of those who teach the MS M.Eng. programme.

2. RUBRICS AND STRUCTURE FOR INDIVIDUAL PAPERS

Each of the five papers in Prelims, comprising the three 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 exemplar answers if so requested by the moderators. There are no external examiners for Prelims. The assessed work for the practicals, the crystallography classes and the project work for Computing in Materials Science (CMS) together constitute the Coursework Paper.

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 maximum marks available for each of these papers are 100. There is no strict rule about how many questions are set on each lecture course in the Materials Science papers 1 - 3. As a result, (i) it should not be assumed that a question will be set on every lecture course and (ii) some questions may require knowledge from across the entire year.

The Maths for Materials Science paper 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.

Examiners proofread the final 'camera-ready' pdf version of each examination paper. Great care is taken to minimise the occurrence of errors or ambiguities. Despite this care, on occasion an error does remain in a paper presented to candidates: if a candidate thinks there is an error or mistake in the paper, then they must state what they believe the error to be at the start of their answer to that question and if necessary, state their understanding of the question.

Coursework paper

The Coursework Paper comprises three examined elements of coursework: (i) for the Practical Course two full reports as specified in the MS Prelims Handbook, together with assessment of the student's laboratory notebook entries for each of the eight specified practicals also as detailed in the MS Prelims Handbook (normally these reports and notebook entries have been marked already as the practical

* for the 2023-24 examinations the Nominating Committee comprised Prof Assender, Prof Marrow & Prof. Speller.

course progresses); (ii) a set of reports for crystallography (completed under the class schedule); and (iii) project work for Computing in Materials Science.

For formal submission of the practical coursework, the Examination Regulations stipulate that candidates are required to submit the Materials Practical Class reports and laboratory notebooks to the Chair of Moderators by no later than 10 am on Friday of the sixth week of Trinity full Term. Further information on this is provided in the MS Prelims Handbook.

The only types of calculators that may be used in examinations are from the following series:

CASIO fx-83
CASIO fx-85
SHARP EL-531

Candidates are not permitted calculators in the Mathematics for Materials Science examination. A basic periodic table is provided in all Preliminary examinations and some Maths definitions and formulae are provided for the Maths examination. (These are available on Canvas).

3. MARKING CONVENTIONS

3.1 University scale for standardised expression of agreed final marks

Agreed final marks for individual papers will be expressed using the following scale: 0-100

3.2 Qualitative criteria for different types of assessment

Qualitative descriptors, based on those used across the Mathematical, Physical and Life Sciences Division, are detailed below:

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. The higher the mark in this band the greater will be the extent to which these criteria are fulfilled; for marks in the 90-100 range there will be no more than a very small fraction, circa 5-10%, of the piece of work being examined that does not fully meet all of the criteria that are applicable to the type of work under consideration. The 'piece of work' might be, for example, an individual practical report, a question on a written paper, or a whole written paper.
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.
50-59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
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.
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.
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.

3.3 Verification and reconciliation of marks

During the marking process the scripts of all written papers remain anonymous to the markers. Each written paper is marked by a single moderator. The moderators must ensure that every page of the script has been fully marked. Those papers identified by the moderator as having marks close to the boundaries of pass/fail and distinction/pass will be fully marked by a second moderator, who has sight of the first moderator's marks, but arrives at a formal independent mark. If the difference in these marks is 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 moderators identify the discrepancy and read the

answer again, either in whole or in part, to reconcile the differences. If after this process the moderators still cannot agree, they seek the help of the Chair, or another moderator as appropriate, to adjudicate. For all other papers, the second moderator checks that the overall mark for each question is consistent with one of three sets of descriptor(s), namely those for <40, 40 to 69, or ≥ 70 as appropriate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

In the event that a possible error in the paper has been identified, the first moderator will consider the validity of the error and assess the impact of the error on candidates' choice of questions and on the answers written by those who attempted a question that contained an error, and will take this impact into account when marking the paper and prior to agreeing a final mark for all candidates.

First year practicals are assessed on a continual basis by the senior demonstrators. The work for the six crystallography classes is assessed by the Crystallography Class Organiser(s), the first of these classes being assessed formatively only. The project work for the Computing in Materials Science is assessed by the CMS senior demonstrator. Satisfactory performance in the practical work, in the crystallography classes, and in the CMS project work is defined in the MS Prelims Handbook. The Practical Courses Organiser reviews the marks for the practicals before they are considered by the moderators, drawing to their attention (i) any anomalously low or high average marks for particular practicals and (ii) any factors that impacted on the practical course, such as breakdown of a critical piece of equipment. The moderators review the practical, crystallography and project marks.

3.4 Scaling

Adjustment to marks, known as scaling, normally is not necessary for prelims.

3.5 Short-weight convention and departure from rubric

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 the 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 this information is not provided 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.

3.6 Late- or non-submission of elements of coursework

Including action to be taken if submission has been or will be affected by illness or other urgent cause, and circumstances in which academic penalties may be applied.

The Examination Regulations prescribe specific dates and times for submission of the required elements of coursework to the Examiners (1. A set of five reports of crystallography coursework as specified in the MS Prelims Handbook (normally each individual report within the set has been marked already as the crystallography classes progress - penalties for late submission of an individual crystallography report are prescribed in the MS Prelims Handbook and are applied prior to any additional penalties incurred under the provision of the present Conventions.); 2. Two full reports of practical work as specified in the MS Prelims Handbook plus the student's laboratory notebook entries for the Prelims Practical Course (normally each individual report and laboratory notebook entries for each of the specified practical classes have been marked already as the Practical Course progresses - penalties for late submission of an individual practical report are prescribed in the MS Prelims Handbook and are applied prior to any additional penalties incurred under the provision of the present Conventions); 3. Project work for Computing in Materials Science as specified in the MS Prelims Handbook. Rules governing late submission of these 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 2023/24 Regulations). A candidate who fails to submit an element of coursework by a prescribed date and time will be notified of this by means of an email sent on behalf of the Chair of Moderators.

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) *Under paras 14.3 to 14.6. In a case where illness or other urgent cause has prevented or will prevent a candidate from submitting an element of coursework at the prescribed date, time and place the candidate may, through their college, request the Proctors to accept an application to this effect. In such circumstances the candidate is strongly advised to (i) carefully read paras 14.3 to 14.6 of the aforesaid Part 14, where the mandatory contents of such an application to the Proctors are outlined and the several possible actions open to the Proctors are set out, and (ii) both seek the guidance of their college Senior Tutor and inform at least one of their college Materials Tutorial Fellows. Some, but not all, of the actions open to the Proctors may result in the work being assessed as though it had been submitted on time (and hence with no late submission penalty applied).*
- b) *Under para 14.7. In the case of submission on or after the prescribed date for the submission and within 14 calendar days of notification of non-submission and without prior permission from the Proctors: subject to leave from the Proctors to impose an academic penalty, 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 Moderators with due consideration given to the circumstances as advised by the Proctors. The reduction may not take the mark below 40%.*
- c) *Under Para 14.3(5). In the case of failure to submit within 14 calendar days of the notification of non-submission and without prior permission from the Proctors: a mark of zero shall be recorded for the element of coursework and normally the candidate will have failed that element. As stated in the Special Regulations for the Preliminary Examination in Materials Science, failure of the coursework will normally constitute failure of the Preliminary Examination.*

If a candidate is unable to submit by the required date and time for any reason other than for acute illness their college may make an application to the Proctors for permission for late submission. An extended deadline may be approved, or late submission excused where there are grounds of 'illness or other urgent cause'. Applications may be made in advance of a deadline, or up to 14 days from when the candidate is notified that they have not submitted. In all cases, the applications will be considered on the basis of the evidence provided to support the additional time sought.

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

Penalties for late submission of individual practical reports and individual crystallography class reports are set out in the 2023-24 MS Prelims Handbook and are separate to the provisions described above.

The consequences of failure to submit individual practical reports or individual crystallography reports are set out in the MS Prelims Handbook (sections 10.6 and 11 of the 2023/24 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 the Preliminary Examination as a whole, as stated in the Special Regulations for the Preliminary Examination in Materials Science.

Where an individual practical report or individual crystallography report 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 Chair of the Moderators, permit the candidate to remain in the examination. In this case for the individual piece of coursework in question (i) the Moderators 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.

3.7 Penalties for over-length work and departure from approved titles or subject-matter

This is not applicable to the Prelims examination.

3.8 Penalties for poor academic practice

Substantial guidance is available to candidates on what constitutes plagiarism and how to avoid committing plagiarism (see Appendix B of the Materials Prelims Handbook and <https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism>)

If plagiarism is suspected, the evidence will be considered by the Chair of the Moderators (or a deputy). They will make one of three decisions (<https://academic.admin.ox.ac.uk/examiners>):

- (a) No evidence, or insufficient evidence, of plagiarism – no case to answer.
- (b) Evidence suggestive of more than a limited amount of low-level plagiarism – referred to the Proctors for investigation and possible disciplinary action.
- (c) Evidence proving beyond reasonable doubt that a limited amount of low-level plagiarism has taken place – in this case the Board of Moderators will consider the case and if they endorse the Chair's judgement that a limited amount of low-level plagiarism has taken place will select one of two actions:
 - (i) Impose a penalty of 10% of the maximum mark available for the piece of work in question and a warning letter to be issued to the candidate explaining the offence and that the present incident will be taken into account should there be a further incidence of plagiarism.
For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (<https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism>).
 - (ii) No penalty, but a warning letter to be issued to the candidate explaining the offence, indicating that on this occasion it has been treated as a formative learning experience, and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (<https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism>).

3.9 Penalties for non-attendance

Unless the Proctors have accepted a submission requesting absence from an examination, as detailed in [Section 14 of the Regulations](#), failure to attend an examination will result in the failure of the assessment. The mark for any resit of the assessment will be capped at a pass.

4. PROGRESSION RULES AND CLASSIFICATION CONVENTIONS

4.1 Qualitative descriptors

Qualitative descriptors, based on those used across the Mathematical, Physical and Life Sciences Division, are given below:

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.
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.
50-59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
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.
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.
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

4.2 Final outcome rules (Distinction, Pass, Fail)

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.

4.3 Progression rules

To pass the examination and progress to Part I, candidates are required to satisfy the moderators in all five papers, either at a single examination or at two examinations in accordance with the re-sit arrangements detailed below.

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 $\{36 + 38 + 2 \times 40 + 3 \times (40 - 36) + 3 \times (40 - 38)\}$ for both failures to be compensated

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

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.

4.4 Use of Vivas

There are no vivas in Prelims.

5. RESITS

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

Candidates who pass the coursework paper and fail more than two written papers will be asked to resit all four 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 prohibited from progressing to Part I. Exceptionally, a college may allow a student to suspend studies 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.

The mark for any resit required due to non-attendance will be capped at a pass.

6. MITIGATING CIRCUMSTANCES NOTICES TO EXAMINERS (MCE)

[For **late- or non-submission** of elements of coursework, including cases due to illness or other urgent cause, see section 3.6 of the present Conventions.]

A candidate's final outcome will first be considered using the classification rules/final outcome rules as described above in section 4. The exam board will then consider any further information they have on individual circumstances.

There are two applicable sections of the University's *Examination Regulations*.

- **Part 13 Mitigating Circumstances: Notices to Examiners** relates to unforeseen circumstances which may have an impact on a candidate's performance.
- **Part 12 Candidates with Special Examination Needs** relates to students with some form of disability.

Whether under Part 12 or Part 13, a mitigating circumstance notice to examiners should be submitted by the candidate through student self-service/eVision, or by the college on behalf of the candidate as soon

as circumstances come to light. Candidates with alternative arrangements under Part 12 will not be considered under this mitigating circumstance process if they do not submit a separate mitigating circumstances notice.

Where a candidate or candidates have made a submission, under Part 12 or Part 13, that unforeseen factors may have had an impact on their performance in an examination, the moderators will meet to discuss the individual notice and band the seriousness of each notice on a scale of 1-3 with 1 indicating minor impact, 2 indicating moderate impact, and 3 indicating very serious impact.

Normally, this MCE meeting comprises two parts: Part A and Part B. Part A will take place before the meeting of the moderators at which the examination results are reviewed. When reaching these decisions on MCE impact level, the moderators will take into consideration, on the basis of the information provided to it, the severity and relevance of the circumstances, and the strength of the evidence. Moderators will also note whether all or a subset of written papers and/or elements of coursework were affected, being aware that it is possible for circumstances to have different levels of impact on different written papers and elements of coursework. The banding information is used at Part B of the MCE meeting: in Part B a candidate's results are discussed in the light of the impact of each MCE and recommendations formulated regarding any action(s) to be taken in respect of each MCE.

Further information on the procedure is provided in the [Examination and Assessment Framework, Annex E](#) and information for students is provided at <https://www.ox.ac.uk/students/academic/exams/problems-completing-your-assessment>. It is very important that a candidate's MCE submission is adequately evidenced and, where appropriate, verified by their college; the University forbids the Board of Moderators from seeking any additional information or evidence.

7. DETAILS OF EXAMINERS AND RULES ON COMMUNICATING WITH EXAMINERS

The Moderators in Trinity 2024 are: Prof. Angus Kirkland, Dr Enzo Liotti, Prof. James Marrow (Chair) and Prof. Angus Wilkinson. 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 Chair of Prelims.

Candidates should not under any circumstances seek to make contact with individual Moderators.

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Preliminary Examination in 2024:

Component	Mark
Materials Science 1: Physical Foundations of Materials	100
Materials Science 2: Structure and Mechanical Properties of Materials	100
Materials Science 3: Transforming Materials	100
Mathematics for Materials Science	100
Coursework Paper:	
Crystallography Classes	25
Practicals	50
Computing in Materials Science	25
Total	500

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		
	2023/24	2022/23	2021/22	2023/24	2022/23	2021/22
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	44	46	41	100	97.8	100
Fail	0	0	0	0	0	0

(2) If vivas are used

As stated in the Examination Conventions, vivas are not 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

Exam format:

The 2024 Exams were sat in closed book format in Examination Schools, as had been decided to be the preferred format by Faculty in MT 2023. For the second time, individual course lecturers were used as one of the two markers for the questions they had set in the GP papers, mirroring the long-standing process used in the OP papers. This was regarded as being successful, with the examinations committee welcoming the expertise of the course lecturers during the marks reconciliation process.

As per the 2023 exams, the University operated no exam paper corrections process during the 2024 exams whereby candidates could raise queries about potential errors within the first 30 minutes and receive feedback from an examiner; instead candidates were instructed to note any suspected error in their scripts so that examiners could assess and, if necessary, make adjustments when marking.

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

D. EXAMINATION CONVENTIONS

Examination Conventions were issued to all of the candidates, sent electronically along with other information in a letter from the Chair of Examiners. 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 44 candidates for the examination, all of whom were awarded Honours with the exception of three candidates who failed to progress to Part II. 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. Seven candidates opted to take a Supplementary Subject; three 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 a compulsory Introduction to

Materials Modelling course and either a module on Materials Characterisation (twenty candidates) or a module on Atomistic Modelling (twenty-one candidates).

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 the Options Papers, 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. Returning students were offered two additional questions in a separate section from a discontinued course.

Written papers were double-blind marked. Each question was marked by the course lecturer (if not an Examiner then appointed as an Assessor) and an Examiner. Raw marks were reconciled in the usual way.

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.

The Business Plans, submitted in the second year, were marked by two Assessors, one of whom is an innovation project manager from MedSci Division, again with teams being marked as a group.

Candidates' work on the two coursework modules was marked by two Assessors. One of the Examiners reviewed the marks for a number of representative scripts from both modules to ensure consistency between them, 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.

In the 2024 Part I exams the following scalings were applied to marks for the written papers following the procedures set out in section 3.4 of the Examination Conventions:

Following procedure (b), a scaling of +2 was applied to marks for GP1(to compensate for a serious disruption on the exam start time) and OP1 (to compensate for a below-average mark, likely caused by a higher than average paper difficulty).

No further scaling was applied following procedure (c).

As part of the consideration of Mitigating Circumstances (as per Annex E of the university Examinations and Assessment Framework) due to the pandemic, a further scaling of +3 marks was applied to all written papers on the basis that the 2023 Part I cohort had not had the benefit of sitting final school examinations prior to Oxford, their Prelims examinations has been open book sat in their rooms and much of their first year teaching had been remote. The Examiners deemed this to be a disruption to teaching and learning.

The raw overall mean mark for Part I was at 60.99; paper averages for all papers were below (GP1 62.34, GP2 62.32, GP3 63.11, GP4 60.84, OP1 57.77, OP2 63.20). The raw paper mean mark was 62.28%.

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 66.09%, F 56.79% (Overall 62.28%)

Coursework Averages – M 70.26 F 69.47 (Overall 69.93%)

Overall Part I Averages – M 67.38%, F 59.93% (Overall 64.34)

Students with SpLDs were given time extensions in the normal way.

	Overall mark		Written Examinations		Coursework	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	1	0	0	1	0	0
40-50	0	2	3	5	0	0
50-60	4	9	2	5	0	1
60-70	10	4	8	5	10	8
70-80	9	1	9	1	15	9
80-90	2	1	3	1	0	0
90-100			0	0	0	0
Totals	26	17	26	18	25	18

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.

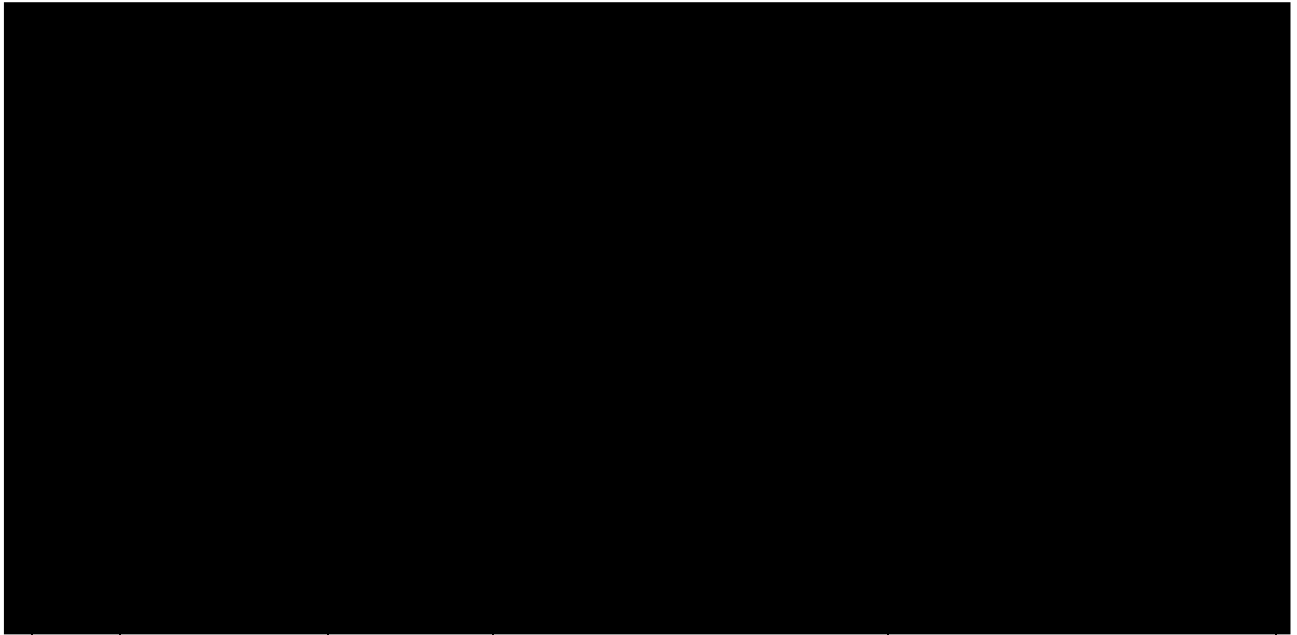
E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

The examiners considered each case carefully and a fair course of action was agreed. This was documented in MCE reports to be made available to examiners for Part II.

For the written examinations, eighteen applications for consideration of Mitigating Circumstances: Notices to Examiners were received. Eight were considered minor and ten were considered moderate. Due to multiple MCEs about the disruption caused during the GP1 paper a cohort wide scaling of +2 was applied.

The Examiners considered each case carefully and a fair course of action was agreed.

All processing of Part I MCE applications was documented in the MCE reports to be made available to Examiners for Part II.



F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. J.T. Czernuszka	Prof. S. Lozano-Perez (Chair)
Prof. M. Galano	Prof. M. Pasta
Prof. R. Todd	Prof. A Watt
Prof. G. Williams (External)	Prof. P. Midgley (External)

GP1 – STRUCTURE AND TRANSFORMATIONS

Examiner: Mauro Pasta

Candidates: 44

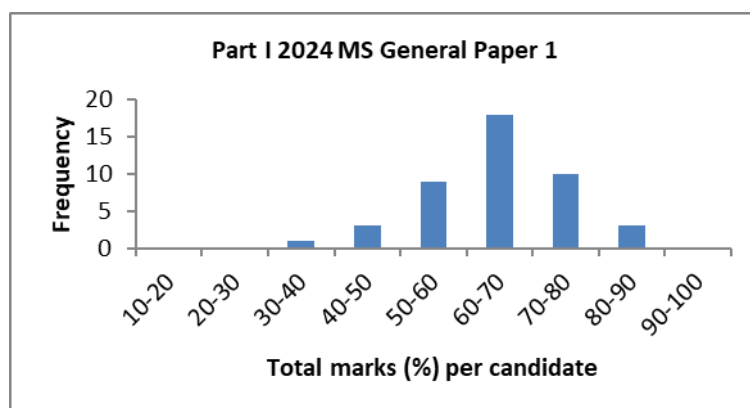
Mean mark: 62.34

Maximum mark: 89

Minimum mark: 36

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	42	14.21	18.5	5.5
2	43	11.02	17.5	4
3	36	13.65	19.5	2
4	21	13.26	18.5	7.5
5	8	9.69	15	2.5
6	5	12.00	15.5	7
7	32	11.14	17.5	5
8	33	12.00	16	4



General Comments

Due to disruptions at the exam school, which caused delays in the start of the exams, the examining board has decided to increase all candidates' marks by 2 points.

Questions 5 and 6 had a limited number of attempts, while the other six questions were well-balanced, showing relatively small variations in average marks and a balanced number of attempts.

The examiners felt the questions were fair and provided a good test of the students' abilities.

Questions:

1. A Pourbaix diagram-based corrosion question. Most students demonstrated a solid understanding of how to read a Pourbaix diagram and interpret the implications of corrosion behaviour in metals. However, in part (a), some students did not report the half-reactions for the water oxidation and reduction reactions. In part (f), several students failed to apply the Nernst equation to calculate the lowest voltage shift.
2. A descriptive question on case studies of corrosion scenarios. Most students were able to assess and comment sensibly on the cases described in parts (a)-(c). However, several students struggled with the case in part (d), either failing to highlight the incomplete answers or failing to identify the challenges associated with closed systems.
3. A question on the differences between thermoplastic and thermosetting polymers. Most students displayed a solid understanding of the link between polymer chemistry, microstructure, and physicochemical and mechanical properties. (a) This section was generally well-answered. However, some candidates did not address all aspects, and some incorrectly suggested that thermoplastics are lightly crosslinked. (b) This section was also generally well-answered, particularly for the thermoplastic examples. Some candidates, however, only provided examples of polymers rather than their applications. (c) The definition of light crosslinking caused problems for some, with students ascribing "light" to mean "weak" or "elastic." While many answers described the situation well, they did not explain it in terms of possible molecular motions. (d) The answers to this section were often the weakest. Candidates frequently described what led to the end of the primary life of the material rather than the limitations in terms of repair or reuse. Explanations as to why this was the case, particularly in relation to the lightly crosslinked nature, were rare.
4. A less popular but generally well-answered question on macroplasticity in rolling. Students showed some difficulty in deriving the expression for the limiting gap draft in part (b) and in explaining the waviness at the edges in part (d).
5. A question on powder processing of ceramics. This was not a popular question, with fewer than 20% of the students choosing to attempt it, and the marks were below average. The question was descriptive and required the recollection of basic concepts from the lecture notes. Students lost marks by not addressing all the required aspects across all sections. No specific trend in errors can be identified.
6. A question on the extrusion of a thermoplastic polymer. Only about 10% of the students attempted this question, but their responses were generally well-answered. No specific trend in errors can be identified.
7. A polymer synthesis question. (a) Few candidates explicitly defined what is meant by molecular weight distribution, although many indicated they understood the concept. (b) Answers in this section were generally weak, with candidates often making vague statements like "higher mechanical properties" without explaining the influence of molecular weight on the property. (c) There were reasonable descriptions of the method, though a typical weakness was omitting that the polymer is in solution and is "washed through" the column with excess solvent. (d) Due to an error in the question, candidates were not penalized for stating that high molecular weight material passes through the column more slowly, as suggested incorrectly by the data given. This error should have indicated that high molecular weight material passes through more quickly, contrary to what the graph showed. However, all candidates applied the data as given, and there was no indication of confusion caused by this error in their answers. Overall, many candidates correctly provided the formulas for average molecular weights, and a good proportion completed the calculations accurately. Some incorrectly linked number average molecular weight to the peak of the curve and weight average to the centre of the area. Few candidates utilized data from the graph for calculations.
8. A descriptive question on the production of steel. Sections (a)-(c), which dealt with the description of the steel-making process and the blast furnace, were generally well-answered, although some candidates did not address all aspects. In section (d), which focused on sulphur removal, some students struggled to report the correct desulfurization reactions. In section (e), only a

few students were able to provide the correct thermodynamic expressions to demonstrate how phosphorus is efficiently removed at this stage.

GP2 – ELECTRONIC PROPERTIES OF MATERIALS

Examiner: Andrew Watt

Candidates: 44

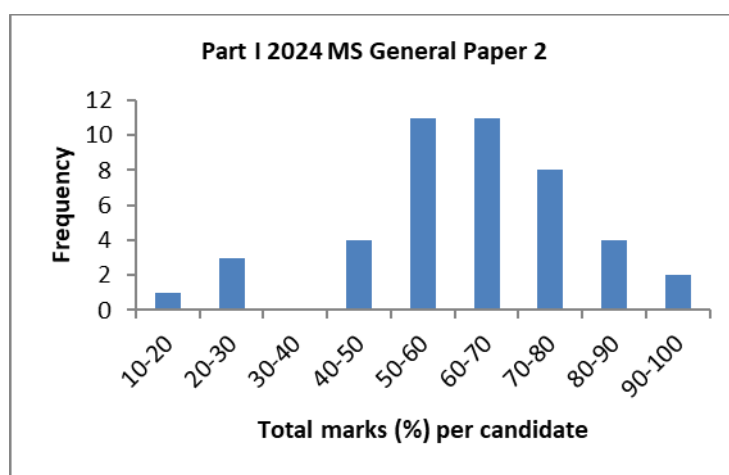
Mean mark: 62.32

Maximum mark: 95

Minimum mark: 15

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	35	12.24	18	5
2	18	12.08	20	4
3	39	13.60	20	3
4	35	12.71	20	1
5	39	13.88	20	5
6	21	10.02	19	0
7	27	10.31	17.5	1
8	5	16.00	18	14.5



General Comments

Overall, a well-answered paper with an average mark of 63%. The mark distribution was Gaussian with a small low mark tale. Some candidates managed to score very highly and consistently. I would judge the difficulty level to be appropriate, though perhaps a little flat through each question. Testing candidates' knowledge and understanding of topics well. Examiners might want to consider the profile of difficulty as question progress and increase the amount of problem solving in later parts of some questions. This would stretch candidates further and differentiate First and Second-class degrees clearly. Most topics in this paper are covered by a single lecturer which is of benefit to the students in terms of course narrative. This means that the content students receive is not overloaded, duplicated and that explanations and equations are consistent course wide. Overall these courses in GP2 are very fit for purpose.

- 1) A reasonably popular general EM question with 35 attempts covering dipoles, EM waves in the complex plane and microwaves. Question almost entirely book work with no calculations and minimal problem solving.
- 2) A question on the propagation of EM waves in materials which was less popular than Q1 with 16 attempts. This question had more problem solving involved and could be approached from first principles. It is not clear why this question was not popular perhaps not enough practice with these types of calculations.
- 3) Joint most popular question with 40 attempts, prototypical general atomistic modelling question that students are well experienced in answering with a higher-than-average mark.
- 4) 35 attempts, another prototypical atomistic modelling question this time looking at specific materials examples, students struggled with some of the later question parts suggesting the level of difficulty was appropriate.
- 5) Joint most popular question with 40 marks on the tight-binding model, again a prototypical question for this course.
- 6) A less typical question for this course modelling magnetic properties, only 18 students answered and some struggled reflected in the low average mark. I suspect that this is probably due to less experience answering this sort of question.
- 7) The more popular semiconductor question with 31 attempts, quite an easy general question though students struggled in parts.
- 8) Least popular question in paper with only 5 attempts, students who did answer scored highly with an average of 16. Possible reasons for this anomalous question, (1) the course is given in 2 parts and the volume of information is increased as compared to single lecturer courses. (2) The question is equation heavy.

GP3- Mechanical Properties of Materials

Examiner: Jan Czernuszka

Candidates: 44

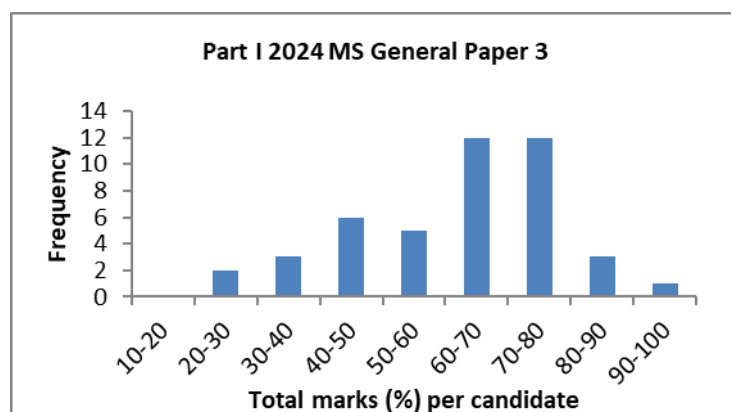
Mean mark: 63.11

Maximum mark: 91

Minimum mark: 29

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	36	12.94	20	3
2	34	15.10	19	7
3	35	15.06	19	4
4	19	10.00	14.5	5
5	38	9.97	18	0.5
6	16	9.13	16	3.5
7	11	12.18	16	6.5
8	31	13.15	19.5	5



General Comments

Overall, an average mark of 63/100, meaning no scaling of the marks was required. Each question had a wide spread of marks with many excellent answers, including a number of 20/20. The majority of the candidates produced scripts that had attempted each part of each question. Higher marks were obtained by candidates that demonstrated their ability to use the information provided from the course and apply it, and not merely a memory test.

The popularity of each question split almost neatly into two sets: questions 1, 2, 3, 5, 8 were overall more popular than 4, 6, 7. There also seemed a (small) link between the average mark and the popularity.

The examiners felt the questions were fair and provided a good test of the students' abilities.

The requirement for using Latex in paper setting is such a poor choice leading to a lot of extra and unnecessary work for the examiners.

Questions:

1. Elastic deformation of materials: Isotropic Elasticity: A straightforward question combining thin walled and thick-walled approximations to calculations of the stress state in a cylindrical pressure vessel. A wide spread of results was obtained. Marks were sometimes lost in part (a) by trying to use a mathematical approach rather than a descriptive approach for which the question asked. The most popular question.
2. Elastic deformation of materials: Polymers & Composites: A two-part question. The first part was concerned with the mechanical properties of polymers and how they varied with strain rate and processing conditions. The second part related to the elastic behaviour of composites. A multiple part question covering fibre aspect ratios and compliance matrices. The final part (b(iv)) was often answered by plotting the compliance rather than the modulus. A popular question.
3. Plastic deformation of materials: Dislocations: A question about fundamental properties of dislocations. An introduction about how to characterise them leading to questions about their mutual interactions. A popular question.
4. Plastic deformation of materials: Microplasticity: A more practical question involving dislocations and how their interactions with microstructural features can explain the observed mechanical properties. Not a popular question.
5. Structural failure of materials: Fracture A question involving indentation fracture mechanics and surface residual stresses. Mainly a mathematical question with some processing elements. A popular question.
6. Structural failure of materials: Fracture of three separate classes of material: polycrystalline steel, amorphous polymers and fibre reinforced composites, requiring largely descriptive answers. A balanced question asking the candidates to relate observed fracture behaviour to important microstructural features. Not a popular question.
7. Structural failure of materials: Creep. A largely mathematical question involving empirical data (provided). Not a popular question.
8. Structural failure of materials: Fatigue A question relating how the bending component of the loading on an axle influences component lifetime. A popular question.

GP4 – ENGINEERING APPLICATIONS OF MATERIALS

Examiner: Sergio Lozano-Perez

Candidates: 44

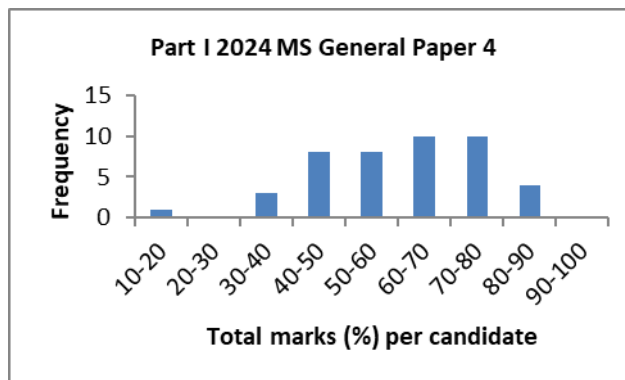
Mean mark: 60.84

Maximum mark: 82

Minimum mark: 17

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	21	13.38	19.5	3
2	21	10.45	19	3
3	17	9.65	16	3.5
4	24	12.94	18.5	3
5	37	12.07	17.5	3
6	34	12.38	18.5	3
7	29	10.64	18	3
8	37	14.43	20	3.5



General Comments

The GP4 paper had a slightly lower average mark when compared to last year (60.84 vs 62). This is the first cohort who didn't experience the impact of COVID in the university, but the option of taking the lectures online resulted in a lower than average "in-person" lecture attendance in subsequent years. The consequences of this change in habits are still not clear, but might need some consideration when overall marks are compared between years. The style of the questions reflects the new policy agreed by faculty, where open-book style questions are encouraged. This resulted on questions where, even when a definition was expected in the answer, some sort of reasoning or links with other aspects of the subject were expected too. In general, there were not many "top marks" answers and most of the students seemed to lack that deeper understanding. There no correlation between the popularity of the questions chosen and the marks achieved.

Questions:

1. This question presented the students with a real case study and asked them to discuss the choice of characterization techniques for a specific project. It was chosen by 48% of the students and the average mark was 65%, which is representative of all the subsections. The students generally identified the best techniques to characterize precipitation, although there was little thought on FIB 3D. The benefits of adding TEM and APT to the characterization were generally well understood and explained.
2. This question mixed some general knowledge on transmission microscopes and a real case study. It was chosen by 48% of the students and the average mark was 62%, which is representative of all the subsections. The majority of the students struggled to correctly identify and name the key parts of a microscope: Source, condenser, objective and projection lenses. When it came to the image provided, the majority successfully identify the source of the dark spots, although struggle to relate their location and size to the electron probe, its size and the step size.
3. This question is about XPS. It mixes some general knowledge with explanations of some specific aspects of the technique. This question was the least popular one, only taken by 38% of the students. It also has the lowest average mark at 48%. The background knowledge of XPS was generally good, as well as the understanding of the origin of the signal measured. However, very few students managed to explain how it compares to similar surface techniques or explain where the background in the signal comes from.
4. This question covers probe techniques including STM and AFM. Some experimental images are provided for discussion. It was chosen by 54% of the students and the average mark was 65%, although some subsections were higher achieving than others. The students understood the effect of tip size on resolution, but struggled to appreciate the effect of rastering the tip on the surface in terms of damage.
5. This question covers ternary phase diagrams, providing one as an example, and phase transformations. This was one of the most popular questions, chosen by 84% of the students and the average mark was 60%, with subsections a and b giving top marks and the others generally low. In the first half of the question, the students had to identify types of reactions and discuss freezing sequences, which they did well. The 2nd half referred to phase transformations during ageing in a 7xxx series Al alloy. The majority of the students failed to describe them well, particularly their growth mechanisms. They also fail to identify the main overaging mechanisms.
6. This question related to heat capacity, including general knowledge and specific behaviour of compounds. It was chosen by 77% of the students and the average mark was 62%, which is representative of all the subsections, with the exception of the last one, which they found harder, struggling to calculate the spring constant.
7. This question covered diffusion in metal. In the first part, diffusion of H in steels was discussed, with several related plots provided for reference. In the 2nd part, the role of an oxide layer as a diffusion barrier is discussed. There is a final section on diffusion in eutectoid microstructure evolution. It was chosen by 66% of the students and the average mark was 53%, which is representative of all the subsections. The students successfully explained the differences in diffusion rates of H in austenite and ferrite, but for the case of C mostly failed to mention the partition of Cr and Mn between the two phases.
8. In this question, the expression of the partition function for a system with a set of discrete energies is provided, and the student are required to find the expression for specific systems. This was one of the most popular questions, chosen by 84% of the students and the average mark was

also the highest at 72%, with most subsections done correctly with the exception of b i. In b i, the students had to demonstrate that a partition function takes a particular form, with some “intense” integration required (although some hints were provided). Many students couldn’t finish the demonstration.

Materials Options Paper 1

Examiner: Richard Todd

Candidates: 44

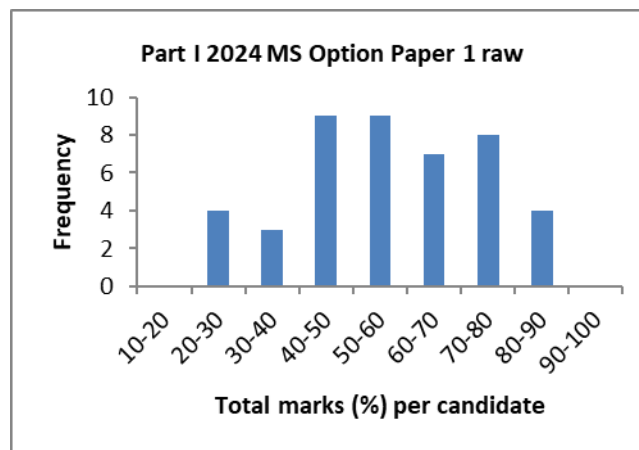
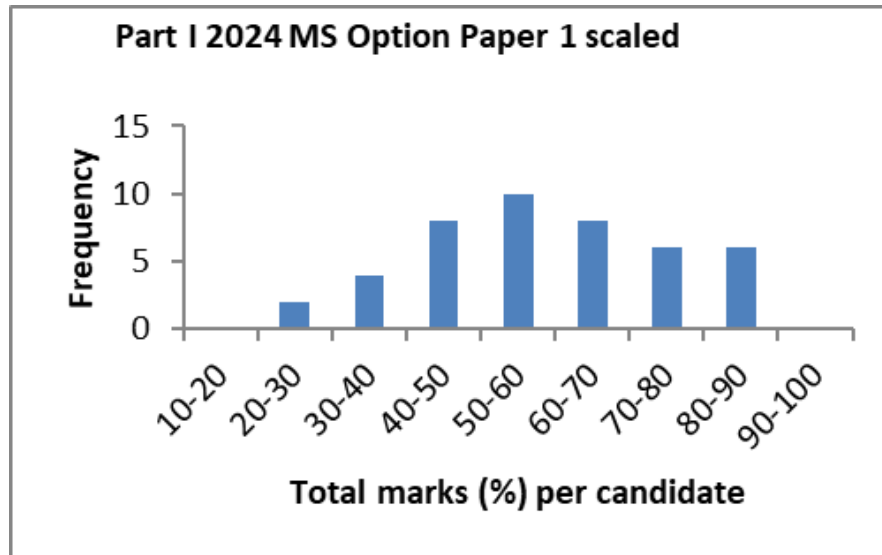
Mean mark: 57.77 (raw) 59.77 (scaled)

Maximum mark: 88

Minimum mark: 29

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	19	11.37	24.5	3
2	24	14.67	21	4
3	22	14.80	22.5	6
4	27	16.59	22.5	5
5	4	12.50	18	9
6	24	14.75	22	1
7	10	16.40	23.5	8
8	14	17.29	22	12
9	21	12.64	19.5	4
10	10	11	20.5	3.5



General Comments

The totals for this paper displayed a wide range of marks and this was also true of many of the individual questions, indicating a variety of capabilities within the cohort on these courses. All questions had a highest raw mark of greater than 70%, indicating that none was seriously flawed, but the majority also had some answers with extremely low marks. There was also evidence that some candidates felt forced to attempt questions from courses they had not opted to engage with (see comments on Q1 below). In view of this, and backed up by the fact that the same set of students scored consistently in the low to mid 60s in the other 5 papers, the total mark was scaled upwards towards 60% by adding 2 marks.

Questions:

1. A few students achieved high marks on this question, which tested both processing and mechanical properties parts of the Engineering Ceramics course. Identifying the micrographs proved problematic for many students and relating the load transfer in short fibre composites to Weibull statistics was also difficult for some. Some attempts attracted very low marks and it is notable in this context that whilst 31 students attempted either Q1 or Q2, only 24 had done the question sheets and attended the classes on the Engineering Ceramics course.
2. Much of this question, on ceramic powder processing and thermal shock, was “unseen”, in keeping with it being suitable for open book exams if necessary. Some students were

sufficiently familiar with the course material to obtain high marks whilst others, though familiar with the course, were unable to assemble the arguments into a complete answer. Several candidates seemed to have little knowledge of this course.

3. A popular question on predicting the vibrations of molecules. Many candidates did well in linking the maths to the physical meaning, as required in several parts of the question. Although many answers showed a general awareness of what was needed for part (c), worth 8 marks, only a few managed to navigate all the way through it without error. Reasonable attempts were made by many at the “unseen” parts.

4. The question concerned the equilibrium structure of materials and their elastic properties, and was the most popular question on the paper. Overall, a good knowledge of the subject area was displayed by most candidates. Most candidates also understood what they needed to do in the derivations of b(iv) and (v) but some were let down by basic mathematical errors.

5. The least popular question, chosen by only 4 candidates, on EPR spectra. All candidates answering the question were aware of the principals involved and marks were determined by the extent to which they could apply them in detail.

6. The question used a particular example of a superconducting cable to probe a range of topics, including both fundamental knowledge and the design and processing of superconducting cables. Many candidates showed good familiarity with the subject and the marks reflect a range of abilities to apply this in depth. Part ciii proved most difficult with only a few candidates correctly making the connection between the stiffness of the substrate and the current in the superconductor.

7. Most of the minority of candidates who chose to do this question, on optical fibre cables, knew the main points in part (a) concerning the characteristics of optical fibres. The calculation in part (b) was either done well or scored zero.

8. The essay part of this question on solar cells was generally well done with candidates showing a good knowledge of the main issues. With the exception of the shunt resistance, high marks were also obtained in the calculations. The question had a mistake in it that made the answer to the last part (b(v)) nonsensical ($V_{oc} \times I_{sc} < \text{actual power output}$). This did not prevent the fill factor from being calculated, however, so most candidates were able to obtain full marks (2). The benefit of doubt was given to one or two candidates who may have been puzzled by this.

9. Many answers displayed some knowledge of alloy steels and the general roles that alloying elements can play but fewer were able to focus this knowledge in detail on the particular steels in this question. The role of particles in limiting grain growth in HSLA steels was not highlighted by many and similar comments apply to the contrast between high temperature properties of HSLA steels and the 9Cr ferritic steel in (b).

10. Moderately popular question on the processing of non-ferrous alloys, attracting a wide range of marks. A few candidates knew sufficient detail to score highly but other answers either missed the point or were too general.

Materials Options Paper 2

Examiner: Marina Galano

Candidates: 44

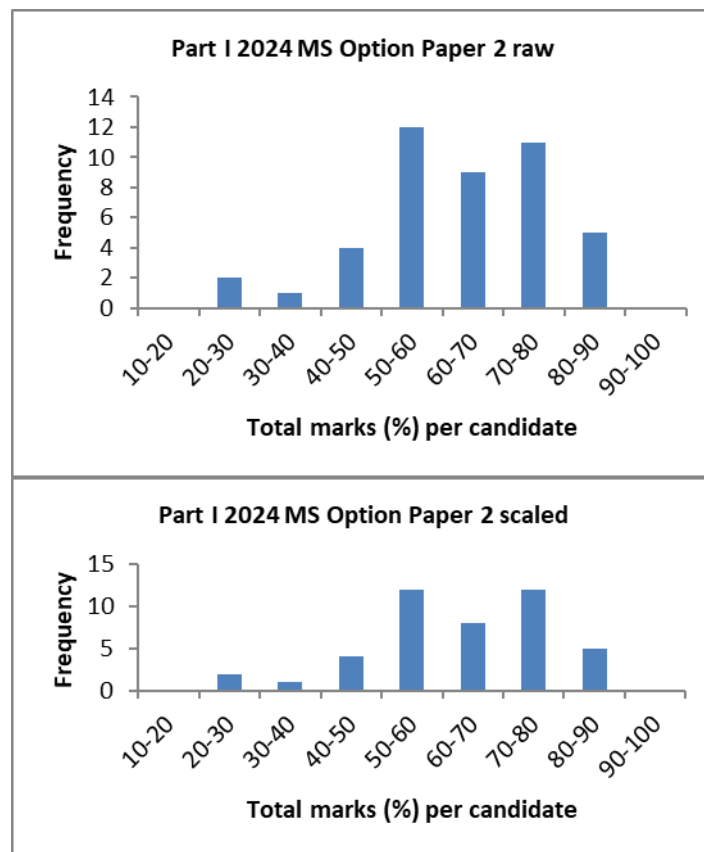
Mean mark: 63.2 (raw) 63.32 (scaled)

Maximum mark: 88

Minimum mark: 27

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	12	16.33	21.5	11
2	14	14.07	21	2
3	5	12.05	17	8
4	21	13.67	22	4
5	19	14.03	21.5	8.5
6	9	14.17	19.5	7.5
7	20	17.90	23	9
8	20	23.5	23.5	3
9	5	16.30	20.5	14
10	5	14.70	20	2
11	20	15.88	23.5	2.5
12	26	18.17	25	9.5



General Comments

The performance on the paper was satisfactory.

There was a reasonable spread between all the questions with question 12 (Enabling Materials from technology to Devices) being the most popular.

Questions:

1. This question was answered by 27% of students with an average mark of 64%. This question was divided into two parts related to different parts of the course.

Part a) answers were satisfactory. Some students struggled using the model to predict the values of the change in the yield stress for each sample.

Part b) Well done by some, but a common error was to confuse the functions and mechanisms of control and moderation, and to incorrectly identify material of the control rod in an AGR.

Most gave a reasonable explanation of the immediate effect of removing control rods, but few clearly explained the role of delayed neutrons in the interaction of reactivity with neutron cycle lifetime and power. Most did not give a clear explanation (if any) of the feedback mechanism(s) that reduce the reactivity and stabilise power. A few confused control with moderation.

2. Materials for nuclear systems. This question was done by 31% of the students. Answers were satisfactory averaging a 56%. Some answers were too general lacking focus on the topic asked, this was more marked in the topic related to Zirconium alloys as cladding materials.

3. Energy Materials. This question was one of the least favourites only taken by 11% of the students. The average mark was slightly below the other questions, 48%. Answers vary in level of detail and the explanation for the electrochemical stripping method for the determining the ECSA of a Pt electrode was the part of the questions that had more discrepancies in the level of the answers.

4. Energy Materials. This question was answered by 50% of the candidates and the level of the answers were generally good with a good average mark 55%. The question covered the topics at a reasonable level increasing in the difficulty throughout the questions evolved. Answers to part e) that asked for a plot of the open circuit voltage vs discharge capacity curves

5. Biomaterials and natural materials. This question was answered by 43% of the students with an average mark of 56%. Students showed a generally good knowledge of the topic. Several found part a) iv more difficult.

6. Biomaterials and natural materials. This question was taken by 20% of the students and the average mark was reasonable. The students scored reasonably well in the first parts of the question however had more difficulty for the last parts c and d.

7. Advanced Polymers. Most students responded this question that covered a substantial part of the course well. The total average for this question taken by 45% of the students was 75%. Q7-a, needed a basic understanding of the lecture note material. Q7-b tested students' general knowledge of the course. Students performed better than the average for Q7-b.

8. Advanced Polymers. The total average percentage for Q8 (45% of the students) was satisfactory 65%. Only Q8-c required a problem-solving approach. While most students were familiar with the equations, they had difficulties solving the problems and arriving at final solutions. Students achieved an average level of performance in this regard.

9. Quantum Technology. This was one of the least popular questions only taken by 11% of the students. The average mark was reasonable and all the students did reasonably well. The level of the answers was good throughout the entire question.

10. Quantum Technology. This was one of the least popular questions only taken by 11% of the students. The average mark reasonable. Students found part e and f more difficult.

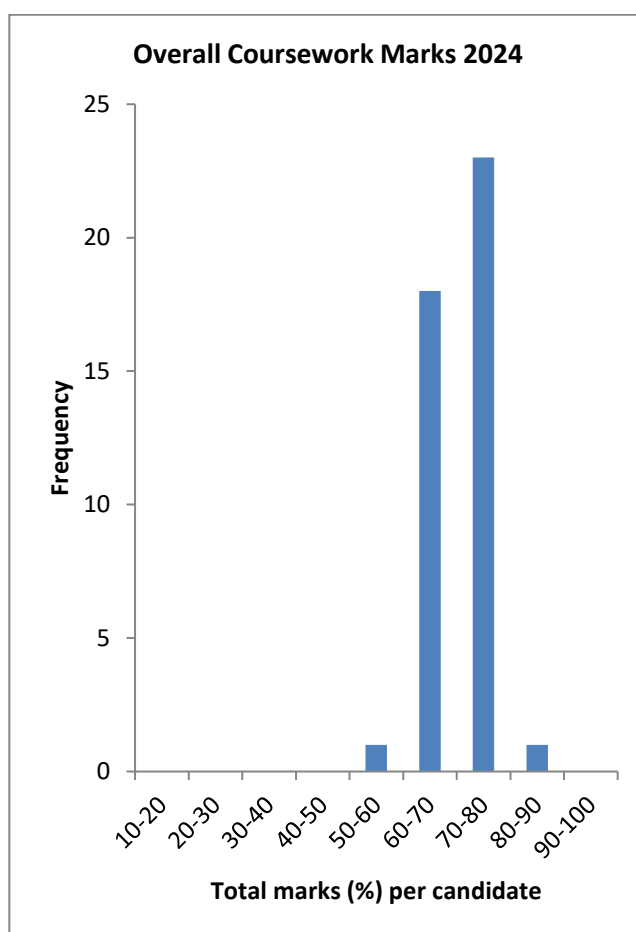
11. Enabling nanotechnology - from materials to devices. The average mark was 63% and it taken by 45 % of the students. Part a) and b) were answered well. Students gave more spread answers for part c and d where electrohydrodynamic jet printing got answers that were not fully described. Additive nanomanufacturing technique to fabricate MEMS devices was not well attempted and the answered were lacking details.
12. Enabling nanotechnology - from materials to devices. This was one of the most popular questions taken by 59 % of the students, the average mark was also high at 72%. The true or false part of the questions was answer well. Explanations for part c) and d) were at an adequate level with a good level of details.

COURSEWORK

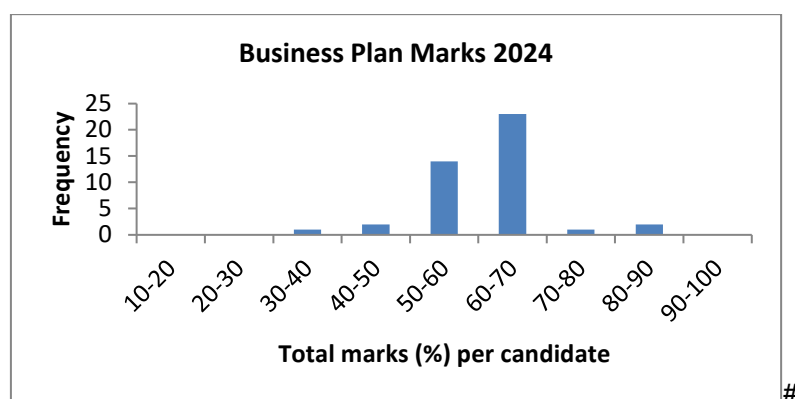
A maximum of 200 marks are available for Part I coursework which comprises:

- Y2 Entrepreneurship Module: Business Plan – 20 marks
- Y2 Industrial Visit and Talks Reports – 10 marks
- Y2 Practical Lab Reports – 60 marks
- Y3 Introduction to Modelling in Materials – 30 marks
- Y3 Option Modules: Advanced Characterisation/Atomistic Modelling– 30 marks
- Y3 Team Design Projects – 50 marks

Overall coursework marks were good, and in the range expected for what is generally continuously assessed work.



The **Business Plan** marks (average 66.17%) were in a relatively narrow range.



Report on Business Plan 2024

The candidates for this module were arranged into 5 separate teams, with each team submitting a single business plan. The business plans were marked by two assessors according to the marking scheme published in the course handbook, and were subsequently moderated. Each member of team was awarded the same mark on the basis of the teams work. The assessment criteria are based on 8 different sections of the business plan which are weighted according to their importance for the plan.

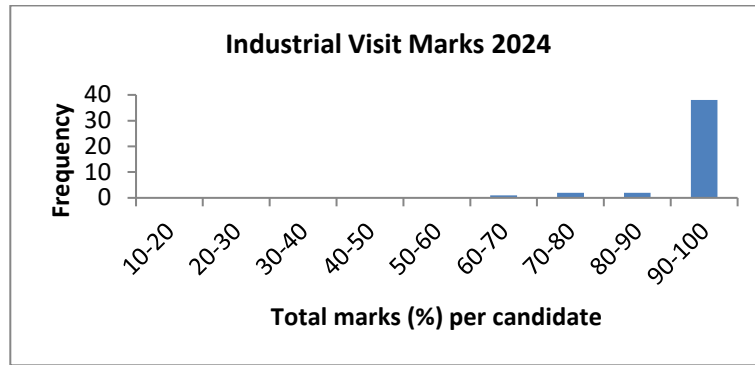
The different teams performed strongly on different sections of their plans, however that was accompanied by each team having notably weak or average sections of their plan too. This inconsistency across the sections weakened the cases being made, and had an effect on the overall marks given. A strong business plan, which would receive high marks should have strong rationale and arguments in all of the sections which combined make a compelling case (and accordingly high mark).

In 2023, an area of significant weakness across most plans was in the Business Strategy section. Some obvious inconsistencies in this section could be attributed to lack of team work. We strongly recommend that for 2024 onwards, teams are told to meet in person at least 3 times during the preparation of the business plan – once at the beginning to come up with an idea and distribute tasks, once while the plan is being prepared, and once to finalize the plan – this is instead of organizing this via emails.

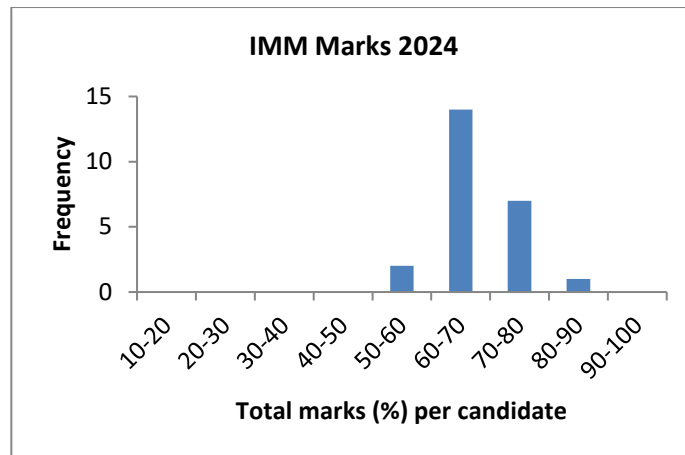
A significant percentage of the marks (40%) are for the commercialisation issues and risk assessment sections where students can reflect on the challenges faced by their proposals. Most teams could have spent more time and effort thinking through the issues that may be encountered in commercialising their idea and summarising them clearly. Most teams could have developing their risk assessment sections more thoroughly, both identifying and presenting the major and most impactful risks and developing associated mitigation strategies.

This suggests that the teams did not commit enough time to reflect on the overall business idea, and the weakest sections, and then articulate and present clearly a reflection of the most significant challenges the plans presented. Financial sections also must reflect logical thinking from a customer standpoint – this again would benefit from the team having meetings mid-preparation to test different standpoints.

The **Industrial Visits** mark (average 96.28%) are near-perfect, as full marks can be obtained by producing a good report; the small number of reports that are only satisfactory or late are strongly penalised.



Marks for the compulsory **Introduction to Modelling in Materials** module (average 62.32%) ranged throughout the lower 2nd to 1st class boundaries.



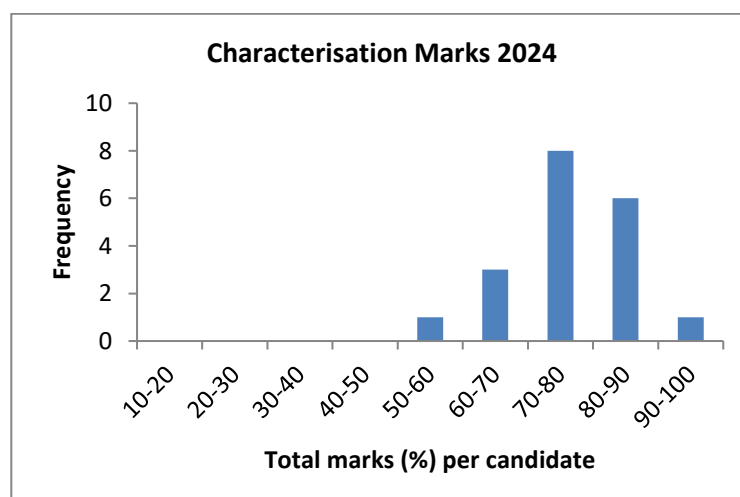
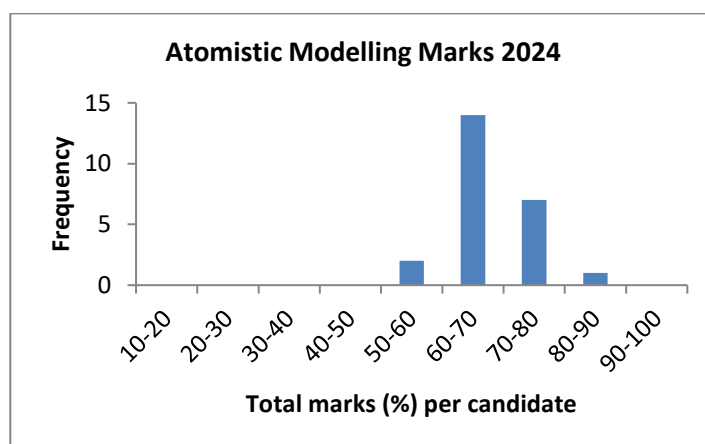
Report on the Introduction to Modelling for Materials Science module

The four classes were held in person this year, with the teaching split across two class rooms. The classes ran smoothly - it my impression that the number of students with prior computing experience continues to increase, and this helps the whole cohort. Support for the projects was provided through a dedicated email address and two demonstrator sessions. Only a small number of students attended the in-person sessions, and very few emailed questions were received.

The best reports included well-presented graphs from carefully designed computational experiments. Observed phenomena were noted and discussed. Low scoring reports typically presented minimal results, without any discussion of the underlying science. Almost all students submitted working code, and the wide distribution of marks was due to the varying quality of the submitted reports.

Prof. Jonathan Yates
Professor of Materials Modelling, Dept of Materials, University of Oxford
Dean / Tutor for Materials Science, St Edmund Hall, Oxford.

The option modules, **Atomistic Modelling** (average 67.08%) and **Advanced Characterisation** (average 74.50%), exhibit a full range from lower 2nd class to good 1st class marks. The work done was reviewed independently by the Examiners.



Report on Atomistic Modelling Option Module

The Atomistic Modelling module followed the same format as previous two years, being run in-person in the teaching room in the MML. 22 students took the course. The first week consisted of morning and afternoon sessions, starting with a 30-40-minute lecture followed by a hands-on practical session. In the second week, students were assigned pseudo-randomly (balanced across colleges) one out of three possible projects. The teaching room remained available as a work space in this time. Support was given via email. Each student was given a user account on one of four multi-core Linux servers based in the Department. The students were instructed how to install and use freely available software (e.g. MobaXterm) to access these servers from the various operating systems installed on their own personal computers. The modelling calculations were performed using CASTEP, with additional postprocessing and analysis performed using the OptaDOS and SUMO packages. All of these packages were pre-installed on the servers and the students instructed how to run software serially and in parallel. There were no significant technical issues.

As in the previous years, the written reports were of a good standard overall. Many of the introductions were rather short (why is the material you are studying interesting to material scientists?). Another notable gap was that many students didn't justify their choice of computational parameters. This doesn't need to be extensive - but a sentence or two is better than nothing.

**Dr C.E. Patrick
2023-24**

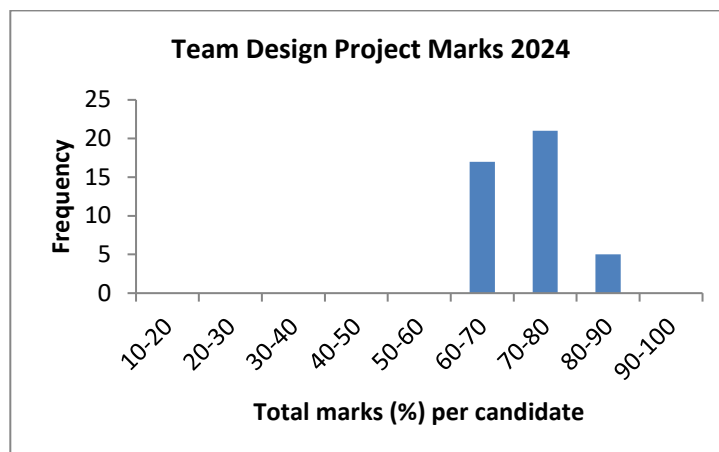
Report on the Characterisation of Materials Option Module

This module is intended as a hands-on learning experience for students to further their theoretical understanding of materials characterisation techniques and to develop skills in its practical implementation in the laboratory across a range of instruments, including optical microscopy, SEM, EDX, XRD, micro indentation and optical emission spectrometer. The course is also intended to help develop skills and experience in independent and unguided research leading into their Part II year.

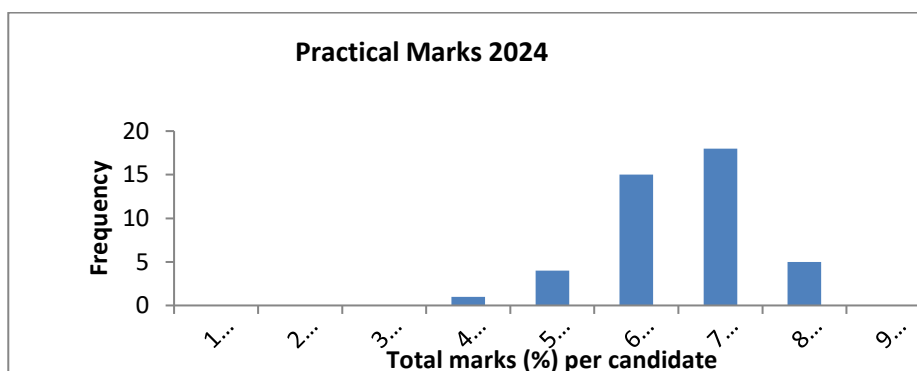
The module organisers sincerely thank the Teaching Laboratory Manager, Diana Passmore, for her invaluable contributions organising the course and facilitating the increased numbers of students in the laboratory. The organisers would also like to acknowledge Dr Megan Carter for her significant input to the planning of the course and leadership in the day-to-day running of the module. Finally, the organisers thank the team of dedicated Junior Demonstrators who facilitated the training and supported access to the microscopes. The Junior Demonstrators went above and beyond to guide, support and solve problems for the students throughout the duration of their time in the lab.

This year the assessors were particularly impressed with the high standard of some of the reports, which were a joy to read. It was evident that the students paid careful attention to the guidance and turned their data into refreshing reports, which made the marking easy. The marks obtained by the 22 students ranged between 17 and 29 out of 30. The average percentage this year was 74.55, which is higher than in previous years.

The **Team Design Project** marks (average 70.18%) show a moderate narrow range, close to the upper second/first class level, which is reasonable given the sustained effort in a group task.



The marks for **Practical Classes** (average 69.3%) have been reviewed by the Practical Class Organiser, who concluded that, although the range of marks for an individual practical varied from practical to practical, all students have been treated equally.



Report on Practical Marks for the Finals Examiners June 2024

Finals

2st year Practicals 2022-23

I have reviewed the marks from the 2nd year Practicals from 2022-23. This year the laboratories ran smoothly with all of them being performed in person in the teaching laboratory.

The range of marks has narrowed (58% to 82% compared to 45% to 92% last year) and the mean is 70% (compared to 74% last year). This is a reasonable range of marks and I am content with outcomes. I am also content with the rather small variation in the marks between different practicals. The average lab

notebook mark was generally close to our objective of 2, and similar to last year, while the average on the reports was between 8.3 and 10.4 (out of 13), with a middle 2.1 mark being 8.45.

Late report submissions and proposed penalties (following the guidance in the course handbook). Up to 15 minutes late is not penalised as per previous years:

Student	College	Practical	Lateness	Reason	Proof submitted	Proposed Penalty
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[illegible]

Plagiarism: No cases of plagiarism were reported by the senior demonstrators.

Practical Class Organiser– Pete Nellist
June 2024

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 (%)				
	23/24	22/23	21/22	19/20	18/19	23/24	22/23	21/22	20/21	19/20
I	13	13	15	19	9	29.5	32.5	36.6	65.5	57.6
II.I	22	23	22*	12	16	50	57.5	53.7	31.0	36.4
II.II	9	4	4	2	3	20.4	10	9.8	3.4	6.0
III		-	-	-	1	-	-	0	0	0
Pass		-	-	-	-	-	-	0	0	0
Fail	0	-	-	-	-	-	-	0	0	0
Total	44	40	41*	33	29	-	-	-	-	-

* 1 candidate completed with a BA (hons)

The examiners note that a significantly higher proportion of Class 1 degrees were awarded in 2019/20 and 2020/21 than in 2018/19, and that in 2021/22 the distribution returned closer to pre-pandemic levels of around one-third of students achieving a Class 1. That trend continues into 2023/24, albeit with a slightly smaller fraction of Class 1 degrees.

(2) The use of vivas

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 vivas was led by the Internal Examiners or Assessor who had read the thesis fully, and one of the External Examiners also had the opportunity to ask questions.

(3) Marking of theses

All these were double blind marked by two Internal Examiners or an Internal Examiner and Assessor, and were inspected by one External Examiner. Due to the modest 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 the Examiners/Assessor who were present. 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 methodology had been implemented in 2020 to implement changes that the Department had resolved to introduce prior to the Covid pandemic, and those that were in response to the pandemic. All of these procedures were used again this year EXCEPT the use of a "safety net". The same report form template was completed by each session Chair as was implemented last year.

All vivas were carried out with Examiners, Assessors and Candidates present in person, with the exception of one examiner who attended online for their vivas. The raw marks for the thesis were reconciled by the Examiners to generate a final mark immediately after the viva.

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

None.

D. EXAMINATION CONVENTIONS

The current year's Conventions were put on the Departmental website and sent electronically to all candidates. 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 44 candidates whose results were ratified by the examiners all were awarded Honours. 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 30-minute viva, during which they were asked detailed questions on their thesis and research work.

The theses were mostly of a high quality, and the candidates were able to explain their work well in the vivas. The marks for the Part II examination ranged from 38% to 80% with an overall mean mark just below the 2:1/1st class boundary. The External Examiners played an important role in the discussions that led to the decisions on the final marks for the candidates and the Chair would like to express his thanks to both of them for their hard work in inspecting the substantial number of Part II theses and contributing to the vivas.

Eight assessors were appointed in addition to the six examiners. This was the same as last year but more than previous years due to the increased number of theses (41). Most examiners marked 8 or 7 theses. Given the reduced Part I marking load, these numbers were felt to be manageable.

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

The mean mark for theses written by female Part II candidates was 68.54% while the mean mark for theses written by male candidates was 67.03%.

There were no applications for consideration for specific learning difficulties made for the Part II component of the exam process this year (although a Form 2D alerting the examiners to an SpLD of some sort was included where appropriate).

	Overall mark		Part II Project		Part I Mark	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	0	0	1	0	0	0
40-50	0	0	0	0	0	0
50-60	8	1	2	1	12	3
60-70	14	8	17	5	11	6
70-80	7	4	10	7	6	4
80-90	2	0	1	0	2	0
90-100	0	0	0	0	0	0
Totals	31	13	31	13	31	13

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 (2024) and Part II for these candidates are given above.

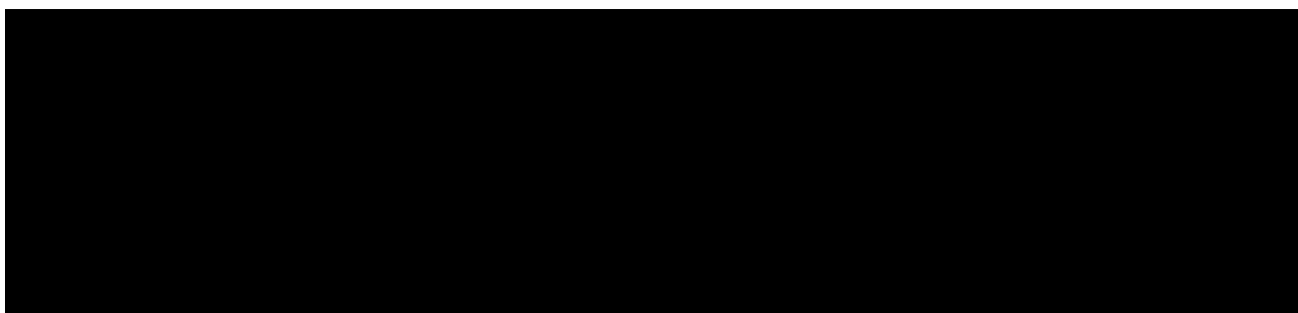
D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Comments on the overall candidates' performance in the Part II coursework are attached.

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

Mitigating Circumstance: Notices to Examiners.

Seven applications for consideration of Mitigating Circumstances: Notices to Examiners were submitted. The examiners considered the cases carefully and a fair course of action was agreed. This was documented in MCE reports. No classifications were changed on the basis of Part II MCEs. There were also 8 MCEs referred to this year's Part II board by last year's Part I board.



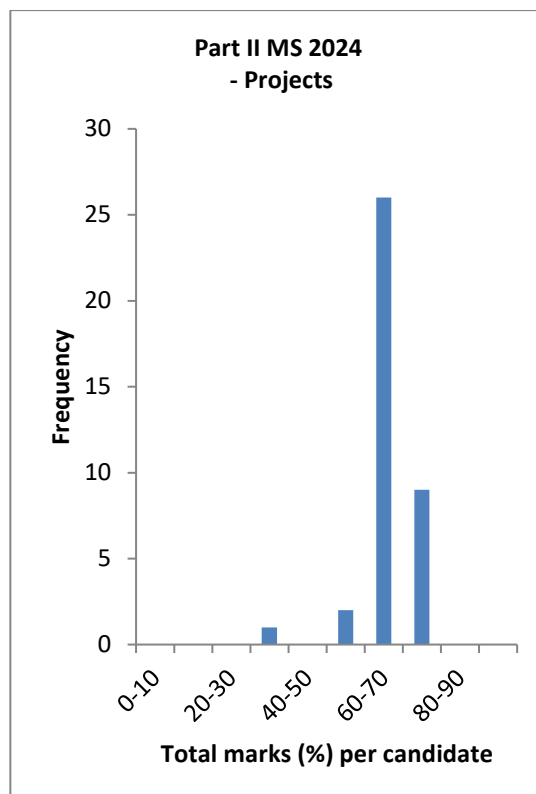
F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. J.T. Czernuszka	Prof. S. Lozano-perez(Chair)
Prof. M.Galano	Prof. M. Pasta
Prof. R. Todd	Prof. A Watt
Prof. G. Williams (External)	Prof. P. Midgley (External)

Professor Marrow is to be thanked for stepping in at short notice when an initially appointed examiner was unable to continue due to ill-health.

Report on Part II Projects

Candidates: 44
Mean mark: 67.48%
Maximum mark: 80%
Minimum mark: 38%



General Comments

As in previous years, the majority of the Part II theses were of a very high standard and the students defended their work very effectively in the vivas.

This year students were able to carry out their Part 2 projects in the normal way.

Examination Conventions 2023/24

Materials Science - Final Honours School

1. INTRODUCTION

Examination conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how examined work will be marked and how the resulting marks will be used to arrive at a final result, a progression decision and/or classification of an award.

These conventions apply to the Final Honours School in Materials Science for the academic year 2023-24. The Department of Materials' Academic (Undergraduate) Committee (DMAC) is responsible for approving the Conventions and considers these annually, in consultation with the examiners. 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 MS FHS Handbook are the editions published in the year in which the candidate embarked on the FHS programme. The Examination Regulations may be found at: <https://examregs.admin.ox.ac.uk/>.

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 examiners are nominated by the Nominating Committee¹ of the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners act on behalf of the University and in this role are independent of the Department, the colleges and of those who teach the MS M.Eng. programme. However, for written papers on Materials Science in Part I examiners are expected to consult with course lecturers in the process of setting questions.

2. RUBRICS AND STRUCTURE FOR INDIVIDUAL PAPERS

All papers are set by the examiners in consultation with course lecturers. The responsibility for the setting of each examination is assigned to an examiner, and a second examiner is assigned as a checker.

The examiners, in consultation with lecturers, produce suggested exemplar answer and marking schemes for every question set, including a clear allocation of marks for each part or sub-part of every question. These are annotated to indicate what is considered 'book-work', what is considered to be 'new material' requiring candidates to extend ideas from what has been covered explicitly in the course, and what is considered to be somewhere in between. This enables the examiners to identify how much of the question is accessible to less strong candidates and the extent to which the question has the potential to differentiate among the very best candidates. The marking scheme for each question aims to ensure that weaker candidates can gain marks by answering some parts of the question, and stronger candidates can show the depth of their understanding in answering other parts. The wording and content of all examination questions set, and the suggested exemplar answer and marking schemes, are scrutinized by all examiners, including the external examiners. The marking schemes are approved by the examining board alongside the papers.

Examiners check that questions are of a consistent difficulty within each paper and between papers.

Examiners proofread the final 'camera-ready' pdf version of each examination paper. Great care is taken to minimise the occurrence of errors or ambiguities. Despite this care, on occasion an error does remain in a paper presented to candidates: if a candidate thinks there is an error or mistake in the paper, then they must state what they believe the error to be and if necessary, state their understanding of the question.

All General Papers comprise eight questions from which candidates attempt five. Each question is worth 20 marks. The maximum number of marks available on each general paper is 100. There is no strict rule about how many questions are set on each lecture course in the General Papers. As a result, (i) it should not be assumed that a question will be set on every lecture course and (ii) some questions may require knowledge from across the core courses from Years 1 and 2.

¹ for the 2023-24 examinations the Nominating Committee comprised Prof Assender, Prof Marrow & Prof. Speller.

Materials Option papers comprise one section for each twelve-hour Options lecture course, each section containing two questions worth 25 marks: 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 maximum 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.

The only types of calculators that may be used in examinations are from the following series:

CASIO fx-83
CASIO fx-85
SHARP EL-531

Candidates are required to clear any user-entered data or programmes from memories immediately before the exam begins. The invigilators may inspect any calculator during the course of an exam.

3. MARKING CONVENTIONS

3.1 University scale for standardised expression of agreed final marks

Agreed final marks for individual papers will be expressed using the following scale: 0-100.

3.2 Qualitative criteria for different types of assessment

Qualitative descriptors, based on those used across the Mathematical, Physical and Life Sciences Division, are detailed below:

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. The higher the mark in this band the greater will be the extent to which these criteria will be fulfilled; for marks in the 90-100 range there will be no more than a very small fraction, circa 5-10%, of the piece of work being examined that does not fully meet all of the criteria that are applicable to the type of work under consideration. The 'piece of work' might be, for example, an individual practical report, a question on a written paper, or a whole written paper.
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.
50-59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
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.
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.
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.

3.3 Verification and reconciliation of marks

Part I Written Papers

During the marking process the scripts of all written papers remain anonymous to the markers. The markers are guided by the suggested exemplar answer and marking schemes.

All papers are marked by course lecturers acting as assessors and an examiner. All scripts are double marked, blind, by the markers each awarding an integer mark for each question. After individual marking the two markers meet to agree marks question by question. If the differences in marks are small (~10% of the maximum available for the question, 2-3 marks for most questions), the two marks are averaged, with no rounding applied.

Otherwise the markers identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the markers still cannot agree, they seek the help of the Chair, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

In the event that a possible error in the paper has been identified, the examiners will consider the validity of the error and assess the impact of the error on candidates' choice of questions and on the answers written by those who attempted a question that contained an error, and will take this impact into account when marking the paper and prior to agreeing a final mark for all candidates.

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

Part I Coursework

In some of the descriptions of marking for individual elements of *coursework* 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 they have recorded their own assessment, and does not indicate that the candidate is anonymous to the markers.

(1) *Second Year Practicals*

Second year practicals are assessed continually by senior demonstrators in the teaching laboratory and in total are allocated a maximum of 60 marks. Part I examiners have the authority to set a practical examination.

(2) *Industrial Visits and Talks*

Reports on Industrial Visits and Industrial Talks are assessed by the Industrial Visits Academic Organiser on a satisfactory / non-satisfactory basis, and in total are allocated a maximum of 10 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 Industrial Visit reports.

(3) *Entrepreneurship*

The business plan for the Entrepreneurship module is double marked, blind, by two assessors appointed by the Faculty of Materials. The written business plan is allocated a maximum 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 throughout the course, the slides from which are published on Canvas.

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.

(4) *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 a maximum of 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 Canvas.

(5) *Introduction to Modelling in Materials*

The reports for this module are double marked, blind, by the module assessors. Normally, at least one of the two assessors for each report will be a module organiser. The assessors then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. The lead organiser for the Introduction to Modelling in Materials Module submits to the Assessors and Examiners of the module a short report which provides (i) a summary of the availability of the software & hardware required for each mini-project and (ii) any other pertinent information. The reports for the Introduction to Modelling in Materials module are allocated a maximum of 30 marks (each of two reports allocated a maximum of 15 marks). Guidance on the requirements for the reports and an outline marking scheme are published on Canvas.

(6) *Advanced Characterisation of Materials and Atomistic 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 organiser. The assessors then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. One of the Examiners oversees this process, sampling reports to ensure consistency between the different pairs of assessors and the two modules. The lead organiser 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 and/or data during the two-week module and (ii) any other pertinent information. An analogous report is provided by the lead organiser for the Atomistic Modelling Module in respect of the software & hardware required for the project. The report for the Characterisation Module is allocated a maximum of 30 marks and the report for the Atomistic Modelling Module is also allocated a maximum of 30 marks. For each module, guidance on the requirements for the reports and an outline marking scheme are published on Canvas.

Part II Coursework

The Part II project is assessed by means of a thesis which is submitted online 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 their 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 a maximum of 400 marks, which is one third of the maximum available marks for Parts I and II combined. Two Part II examiners (or one examiner and one assessor) read the thesis (including the final chapter with the reflective accounts of project management, health, safety & risk assessment processes, and ethical and sustainability considerations), 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 candidates. Any examiners who have supervised the candidate's Part II project or are their college tutor will not be present at the viva or the subsequent discussion. Normally four individuals will have specified examining roles: Two examiners, or one examiner and an assessor, who have read the thesis entirely; the external examiner to whom the thesis was assigned; and an examiner acting as the session Chair who will complete any necessary documentation for that viva. Other examiners beyond these four individuals will be present to the extent possible given the existence of parallel sessions. A discussion involving all examiners present is held after the viva, during which 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.

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.

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

3.4 Scaling

Part I Written Papers

As the total number of candidates 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.

Part I Coursework

Adjustment to marks, known as scaling, normally is not necessary for coursework.

The Practical Courses Organiser reviews the marks for the practicals before they are considered by the examiners, drawing to their attention (i) any anomalously low or high average marks for particular practicals and (ii) any factors that impacted on the practical course, such as breakdown of a critical piece of equipment. The examiners review the practical marks.

Part II Coursework

Adjustment to marks, known as scaling, normally is not necessary for the Part II theses.

3.5 Short-weight convention and departure from rubric

Part I Written Papers

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 this information is not provided 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. 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 covering page. If this information is not provided then the examiners will mark the sections in alphabetical order by section delineator (section A, section B, etc.).

Part I Coursework

It is a requirement for candidates to submit an element of coursework for each of the following: Practical Classes; Industrial Visits and Talks; Entrepreneurship Coursework (or substitution); Team Design Project; Introduction to Modelling in Materials, Advanced Characterisation of Materials or Atomistic Modelling. For the Practical Classes and Industrial Visits & Talks, the element of coursework comprises a set of reports: reports submitted on four Industrial Visits and two Industrial Talks and reports submitted on ten Practical Classes as specified in the Course Handbook. In these cases, a candidate must submit a report for each visit and talk/practical in order to satisfy the examiners. Failure to complete satisfactorily one or more elements of Materials Coursework normally will constitute failure of Part I of the Second Public Examination. Further details about this are provided in the Course Handbook.

3.6 Late- or non-submission of elements of coursework

Including action to be taken if submission has been or will be affected by illness or other urgent cause, and circumstances in which academic penalties may be applied.

The Examination Regulations prescribe specific dates and times for submission of the required elements of coursework to the Examiners (1. One piece of Entrepreneurship Coursework; 2. A set of 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 - 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 the present Conventions.); 3. A Team Design Project Report and associated oral presentation; 4. A set of reports on Industrial Visits and Talks as specified in the course handbook; 5. A report on the work carried out in the Introduction to Modelling in Materials module; 6. A report on the work carried out in either the Characterisation of Materials module or the Atomistic Modelling module; and 7. A Part II Thesis). Rules governing late submission of these seven 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 2023/24 Regulations). A candidate who fails to submit an element of coursework by a prescribed date and time will be notified of this by means of an email sent on behalf of the Chair of Examiners.

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) Under paras 14.3 to 14.6. In a case where illness or other urgent cause has prevented or will prevent a candidate from submitting an element of coursework at the prescribed date, time and place the candidate may, **through their college**, request the Proctors to accept an application to this effect. In such circumstances the candidate is **strongly** advised to (i) carefully read paras 14.3 to 14.6 of the aforesaid Part 14, where the mandatory contents of such an application to the Proctors are outlined and the several possible actions open to the Proctors are set out, and (ii) both seek the guidance of their college Senior Tutor and inform at least one of their college Materials Tutorial Fellows. Some, but not all, of the actions open to the Proctors may result in the work being assessed as though it had been submitted on time (and hence with no late submission penalty applied).
- (b) Under para 14.7. In the case of submission on or after the prescribed date for the submission and within 14 calendar days of notification of non-submission and without prior permission from the Proctors: subject to leave from the Proctors to impose an academic penalty, 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 as advised by the Proctors. The reduction may not take the mark below 40%.
- (c) Under Para 14.3(5). In the case of failure to submit within 14 calendar days of the notification of non-submission and without prior permission from the Proctors: a mark of zero shall be recorded for the element of coursework and normally the candidate will have failed Part I or II as appropriate of the Examination as a whole.

If a candidate is unable to submit by the required date and time for any reason other than for acute illness their college may make an application to the Proctors for permission for late submission. An extended deadline may be approved, or late submission excused where there are grounds of 'illness or other urgent cause'. Applications may be made in advance of a deadline, or up to 14 days from when the candidate is notified that they have not submitted. In all cases, the applications will be considered on the basis of the evidence provided to support the additional time sought.

It should be noted that the maximum extension that the examiners can normally accommodate for a Part II thesis to be examined in the 2023/24 session is 7 days. Any extension awarded for longer may mean the assessment will either be considered by an extraordinary examination board or the scheduled examination board in the next academic year.

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 2023/24 MS 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 Science are set out in the MS FHS Handbook (sections 7 and 10.7 of the 2023/24 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 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 Chair 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.

3.7 Penalties for over-length work and departure from approved titles or subject-matter

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.]

3.8 Penalties for poor academic practice

Substantial guidance is available to candidates on what constitutes plagiarism and how to avoid committing plagiarism (see Appendix B of the 22/23 FHS Course Handbook and <https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1>)

If plagiarism is suspected, the evidence will be considered by the Chair of the Examiners (or a deputy). They will make one of three decisions (<https://academic.admin.ox.ac.uk/examiners>):

- (d) No evidence, or insufficient evidence, of plagiarism – no case to answer.
- (e) Evidence suggestive of more than a limited amount of low-level plagiarism – referred to the Proctors for investigation and possible disciplinary action.
- (f) Evidence proving beyond reasonable doubt that a limited amount of low-level plagiarism has taken place – in this case the Board of Examiners will consider the case and if they endorse the Chair's judgement that a limited amount of low-level plagiarism has taken place will select one of two actions:
 - (iii) Impose a penalty of 10% of the maximum mark available for the piece of work in question and a warning letter to be issued to the candidate explaining the offence and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (<https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1>).
 - (iv) No penalty, but a warning letter to be issued to the candidate explaining the offence, indicating that on this occasion it has been treated as a formative learning experience, and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (<https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1>).

3.9 Penalties for non-attendance

Unless the Proctors have accepted a submission requesting absence from an examination, as detailed in [Section 14 of the Regulations](#), failure to attend a written examination in Part I or the viva voce examination in Part II will result in the failure of the whole Part.

4. PROGRESSION RULES AND CLASSIFICATION CONVENTIONS

4.1 Qualitative descriptors of classes (FHS)

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(i) 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 II(ii) 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 reaching their decisions the examiners are not permitted to refer to a candidate's outcome in, or profile across the assessments in, the First Public Examination ('Prelims').

In borderline cases the examiners use their discretion and consider the quality of the work the candidate has presented for examination over the whole profile of FHS assessments; thus, for Part I outcomes the Part I assessments, and for overall degree outcomes the assessments for both Parts I and II. The external examiners often play a key role in such cases.

4.2 Classification rules (FHS)

Part I:

The examiners are required to classify each candidate according to their overall average mark in Part I as (a) worthy of Honours, (b) Pass or (c) Fail. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks.

Unclassified Honours –A candidate is allowed to proceed to Part II only if they have been adjudged worthy of honours by the examiners in Part I and normally obtained a minimum mark of 50% averaged over all elements of assessment for the Part I Examination.

Candidates adjudged worthy of honours and obtaining a minimum mark of 50% averaged over all elements of assessment for the Part I Examination 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.

Candidates adjudged worthy of honours who do not obtain a minimum mark of 50% averaged over all elements of assessment for the Part I Examination 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 or may retake Part I the following year (subject to college approval).

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 their 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.

4.3 Progression rules

The attention of candidates for Part I of the Examination is drawn to key phrases in clauses 8 and 11 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. 8. No candidate for the degree of Master of Engineering in Materials Science may present themselves for examination in Part II unless they have (a) been adjudged worthy of Honours by the Examiners in Part I and (b) normally obtained a minimum mark of 50% averaged over all elements of assessment for the Part I Examination.

Section A. 11. 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 six elements of Materials Coursework will constitute failure of Part I of the Second Public Examination.

4.4 Use of vivas

There are no vivas in the Part I examination.

In Part II, a viva voce examination is held for all candidates.

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 candidates.

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.

5. RESITS

In the event that a candidate obtains a mark of less than 50% averaged over all elements of assessment of Part I, or if a candidate fails to satisfy the examiners, a resit is permitted. Such a candidate may re-enter for the whole of the Part I examination on one occasion only, normally in the examining session in Trinity Term 2025, following the examiners' original decision. The examination will cover the same material as the original examination and will follow the same rubric. If such a candidate is adjudged worthy of honours and achieves a mark of 50% or more averaged over all elements of assessment in Part I, the candidate may progress to Part II but will carry forward only a capped mark of 50% for Part I.

Part II may be entered on one occasion only.

6. MITIGATING CIRCUMSTANCES NOTICES TO EXAMINERS (MCE)

[For **late- or non-submission** of elements of coursework, including cases due to illness or other urgent cause, see section 3.6 of the present Conventions.]

A candidate's final outcome will first be considered using the classification rules/final outcome rules as described above in section 4. Cohort-wide adjustments will then be considered, e.g. any scaling. The exam board will then consider any further information they have on individual circumstances.

There are two applicable sections of the University's *Examination Regulations*.

- **Part 13 Mitigating Circumstances: Notices to Examiners** relates to unforeseen circumstances which may have an impact on a candidate's performance.
- **Part 12 Candidates with Special Examination Needs** relates to students with some form of disability.

Whether under Part 12 or Part 13, a mitigating circumstance notice to examiners should be submitted by the candidate through student self-service/eVision, or by the college on behalf of the candidate as soon as circumstances come to light. Candidates with alternative arrangements under Part 12 will not be considered under this mitigating circumstance process if they do not submit a separate mitigating circumstances notice.

Where a candidate or candidates have made a submission, under Part 12 or Part 13, that unforeseen circumstances may have had an impact on their performance in an examination, a subset of the internal examiners will meet to discuss the individual applications and band the seriousness of each application on a scale of 1-3 with 1 indicating minor impact, 2 indicating moderate impact, and 3 indicating very serious impact.

For Part I, normally, this MCE meeting will take place before Part A of the meeting of the internal examiners at which the examination results are reviewed. When reaching these Part I decisions on MCE impact level, a subset of internal examiners will take into consideration, on the basis of the information received, the severity and relevance of the circumstances, and the strength of the evidence provided in support. This subset of examiners will also note whether all or a subset of written papers and/or elements of coursework were affected, being aware that it is possible for circumstances to have different levels of impact on different written papers and elements of coursework. The banding information is used at Part B of the meeting of the Part I internal examiners at which the examination results are reviewed: in Part B a candidate's results are discussed in the light of the impact of each MCE and recommendations to the Finals Board formulated regarding any action(s) to be taken in respect of each MCE.

For Part II, a subset of internal examiners will meet to band the seriousness of each notice in advance of the Part II vivas and prior to sight of any preliminary marks awarded by the internal examiners. When reaching these decisions on MCE impact level, the subset of examiners will take into consideration, on the basis of the information received, the severity and relevance of the circumstances, and the strength of the evidence. The banding information will be used at Part B of the meeting of Part II internal examiners, which is held after the vivas, at which the marks agreed following the discussion after the viva are reviewed and recommendations to the Finals Board formulated regarding any action(s) to be taken in respect of each MCE.

Further information on the procedure is provided in the [Examination and Assessment Framework, Annex E](#) and information for students is provided at <https://www.ox.ac.uk/students/academic/exams/problems-completing-your-assessment>. It is very important that a candidate's MCE submission is adequately evidenced and, where appropriate, verified by their college; the University forbids the Board of Examiners from seeking any additional information or evidence.

Candidates who have indicated they wish to be considered for DDH/DDM² will first be considered for a classified degree, taking into account any individual MCE. If that is not possible and they meet the DDH/DDM eligibility criteria, they will be awarded DDH/DDM.

7. DETAILS OF EXAMINERS AND RULES ON COMMUNICATING WITH EXAMINERS

The Materials Science Examiners in Trinity 2024 are: Prof. Jan Czernuszka, Prof. Marina Galano, Prof. Sergio Lozano-Perez (Chair), Prof. Mauro Pasta, Prof. Richard Todd and Prof. Andrew Watt. The external examiners are Prof. Geraint Williams, Swansea University, and Prof. Paul Midgely, University of Cambridge.

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 Chair of Examiners.

Candidates should not under any circumstances seek to make contact with individual internal or external examiners.

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Final Examination in 2024 (For Part I and Part II students who embarked on the FHS respectively in 2022/23 and 2021/22)

	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	60
	Industrial Visits and Talks	10
	Entrepreneurship coursework	20
	Team Design Project	50
	Introduction to Modelling in Materials	30
	Characterisation or Atomistic Modelling module	30
	<i>Part I Total</i>	<i>800</i>
Part II	Thesis	400
Overall Total		1200

² DDH/DDM – Declared to have Deserved Honours / Declared to have Deserved Masters

8. APPENDIX – B.A. IN MATERIALS SCIENCE (EXIT AWARD ONLY)

In their 3rd year, a candidate may opt to transfer out of the M.Eng. programme and seek to exit with a classified B.A. award, via one of the following routes:

- Route 1 – Transfer to the B.A. at the start of the 3rd year
- Route 2 – Transfer to the B.A. at the end of the 3rd year

Route 1

Such a candidate will have studied a reduced subset of Options courses and undertaken an additional element of coursework, comprising a literature-based research module. In this case, the candidate will sit the same Option papers as all other Part I candidates but for each paper will answer only two questions in a reduced timeframe of 1.5 hours. The maximum number of marks available on each option paper is 50, and questions carry equal marks. The literature-based research module will be assessed by means of an extended essay of up to 4,000 words which is submitted to the examiners, who will also take into account a written report from the candidate's academic advisor for this research module. The essay is double marked, blind, by two examiners and allocated a maximum of 50 marks.

Route 2

Such a candidate will have completed the same elements of assessment as for Part I of the M.Eng. and in addition will be required to undertake a literature-based research module during the Long Vacation following the written papers. Consideration of all the results will be made by the examiners in the Trinity term of the year following the written papers. The literature-based research module will be assessed by means of an extended essay of up to 4,000 words which is submitted to the examiners, who will also take into account a written report from the candidate's academic advisor for this research module. The essay is double marked, blind, by two examiners and allocated a maximum of 50 marks.

The examiners will apply to the extended essay the conventions detailed above in relation to:

- *Short-weight and departure from rubric*
- *Late or non-submission*
- *Over-length work and departure from approved titles or subject-matter*

The examiners will apply the conventions that relate to the M.Eng. as detailed above to all other elements of assessment for the B.A.

The qualitative descriptors of classes given in Section 4.1 also apply to the B.A.

Once marking is completed an overall percentage mark is computed for each candidate and classification then takes place. Subject to being adjudged worthy of honours, classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is taken into account only in borderline cases.

Classified Honours – To be adjudged worthy of Honours normally a candidate must obtain a minimum mark of 40% averaged over all elements of assessment, obtain a minimum mark of 40% in each of at least four of the six written papers, and satisfy the coursework requirements.

Pass – The examiners consider that the candidate's overall performance has reached an adequate standard but is not worthy of Honours. The candidate is listed as a Pass on the class list and is awarded a B.A. (without honours).

Fail – The examiners consider that the candidate's overall performance is not worthy of a B.A.

In the event that a candidate obtains a mark of less than 40% averaged over all elements of assessment, or if a candidate fails to satisfy the examiners, a **resit** is permitted. Such a candidate may re-enter for the whole of the examination on one occasion only, normally in the year following the examiners' original decision. The examination will cover the same material as the original examination and will follow the same rubric. If such a candidate is adjudged worthy of honours, as defined under 'Classified Honours' above, the examiners may award a 3rd class Honours classification. The Examiners shall be entitled to award a Pass to a candidate who has reached a standard considered adequate but who has not been adjudged worthy of Honours on the occasion of this resit.

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Final Examination in the B.A. (Hons) exit award in 2024

Route 1

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Materials Options Paper 1	50
	Materials Options Paper 2	50
	Practicals	60
	Industrial Visits and Talks	10
	Entrepreneurship coursework	20
	Team Design Project	50
	Introduction to Modelling in Materials	30
	Characterisation or Atomistic Modelling module	30
	Literature-based research module	50
	Overall Total	750

Route 2

	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	60
	Industrial Visits and Talks	20
	Entrepreneurship coursework	20
	Team Design Project	50
	Introduction to Modelling in Materials	30
	Characterisation or Atomistic Modelling module	30
	Literature-based research module	50
	Overall Total	850

Reports from the External Examiners for Materials

EXTERNAL EXAMINER REPORT FORM 2024

External examiner name:	Prof Geraint Williams		
External examiner home institution:	Swansea University		
Course(s) examined:	Materials Science Parts I and II		
Level: (please delete as appropriate)	Undergraduate		
Year of term of office: (please delete as appropriate)		Last year	

Please complete both Parts A and B.

Part A				
Please (✓) as applicable*		Yes	No	N/A / Other
A1.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience? <i>[Please refer to paragraph 6 of the Guidelines for External Examiner Reports].</i>	✓		
A2.	Do the threshold standards for the programme appropriately reflect: (i) the frameworks for higher education qualifications, and (ii) any applicable subject benchmark statement? <i>[Please refer to paragraph 7 of the Guidelines for External Examiner Reports].</i>	✓		
A3.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	✓		
A4.	Is the assessment process conducted in line with the University's policies and regulations?	✓		
A5.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	✓		
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?*		✓	
* If you answer "No" to any question, you should provide further comments when you complete Part B. ** A6. and A7. If you are in your first year of term of office you should enter select N/A / Other.				

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?*

During the course of my 4 year tenure as external examiner, my overall impression of the standard of academic achievement by the part I and part II student cohort has not changed since my first year in the post. As per my comments of last year, the standards compare extremely favourably with Materials Science degree schemes at other UK universities.

- b. Please comment on student performance and achievement across the relevant programmes or parts of programmes and with reference to academic standards and student performance of other higher education institutions of which you have experience (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

As part of my annual visit for the external examiners meeting and dinner I was again asked to form part of the examination panel for part II vivas, and evaluate 22 MEng final year research dissertations. As in the recent past, the majority of students gave a good performance in their vivas and were able to confidently discuss their results, with most providing plausible answers to the questions posed by the three examiners. However, I felt that the quality of the dissertations was perhaps not as high as in previous years, with many lacking a systematic approach and an appropriate quantity of results for a two-term project. Nevertheless, the performance of the top students in the cohort compared favourably with previous years and in general overall student achievement in the research project aspect of the MEng seems to correlate well with other institutions which provide Materials Science and Engineering schemes.

Prior to part I examinations I was given the opportunity to evaluate and comment upon the four general papers and 2 options papers (along with model answers). All were deemed to be suitably challenging, while the model answers were sufficiently detailed in terms of partial mark allocation to allow an independent marker to effectively grade the submitted answers. During my visit in late June, the morning prior to the exam board meeting afforded some time to scrutinise a selection of exam scripts for all papers. As usual some of the answers submitted by the top students were outstanding and full in accordance with the model answers. In evaluating a selection of scripts submitted by students from the top, middle and bottom of the mark range, there was clear correlation of the grade awarded with the standard of the submitted work, and in most cases there was good agreement of the marks awarded by both the paper setter and second assessor. It is evident also that performance level of students in the Part I exams probably surpasses that of students on materials courses the majority of other UK universities.

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.

Part II research project assessment, involving the participation of the external examiner in addition to two internal assessors/examiners to evaluate both thesis and defence, comprises a rigorous process of grading final year performance. The vivas were conducted in a fair, open and friendly manner and the marking rubric and comments form used by the internal assessors allowed clear evaluation and justification of the apportioning of marks. However, on occasion (and there were several this year), there was a wide discrepancy in the provisional marks of both internal examiners prior to the viva and input from the external examiner was used to decide the actual mark awarded at the conclusion of the viva. Going forward, I feel that more input from the

project supervisors would help in determining an appropriate overall mark. After all, the comments in part B supervisor forms which are opened immediately after the viva are often taken into consideration when negotiating a final mark when there is a significant divergence in opinion. The options to consider are as follows: i. including the supervisor as part of the viva/thesis assessment process or, ii. allowing the supervisor to provide an “indicative” mark for student performance which is taken into account within the marking rubric. Also, I feel that the final mark should take the performance of the student in the viva into consideration. In several instances I felt that an excellent showing by the student is not presently rewarded, since the final mark is fully based on the perceived quality of the thesis. Again, maybe an appropriately weighted viva component should form part of the marking rubric for part II?

As noted in previous reports, the Materials Science part I examination process differs considerably from the approach used by the majority of other UK universities, where typically the module lecturers both set the exam papers and carry out the marking. A second academic colleague performs the role of moderator, where the checking is usually limited to evaluating the accuracy of totalling partial marks of individual answers in exam scripts. Oxford’s approach in employing both paper setter and an independent examiner to mark the answers is more rigorous, but can lead to divergence in the interpretation of applying marks according to the model answers. Fortunately, this year, both the paper setters and assessors seemed to be in good agreement across all papers. It was noted that paper averages were well in line with values from previous years and less scaling was required this year in order to align low average marks for certain papers to a historical norm.

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?

In the time allotted to scrutinise examination scripts and other written assessments during the external examiner annual visit, it is only possible to evaluate a limited selection of material. In addition, the need to correlate written answers with marksheets available only on the online external examiner SharePoint site is both time-consuming and cumbersome. In last year’s report I recommended that some pre-sifting of exam scripts should be done prior to the scheduled external examiner appraisal of assessments, involving pre-selecting representative scripts from all sets of papers which provide examples of submissions from students in the top, middle and bottom of the mark bands. This would allow more efficient use of the external examiners’ time in the morning prior to the afternoon exam board meeting.

However, this year I was disappointed to find that this had not been done and that both external examiners had again to trawl through large piles of scripts and correlate student numbers with those in marksheets available on SharePoint. This wasted a significant amount of time which could have been better employed evaluating other material such as coursework submissions. Please the pre-selection of scripts to evaluate be done next year to avoid wasting external examiner time?

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 external examiners were informed that from next year, the annual practice of changing the chair of the exam board would cease and that a permanent chairperson would be appointed to oversee all aspects of the assessment process. This is a welcome move, since in the past it has been extremely challenging for the incoming chair to glean sufficiently detailed knowledge of all rules, regulations and procedures within a 1-year term. A permanent chair should help make all

the assessment procedures and various meetings run more smoothly and efficiently in the coming years.

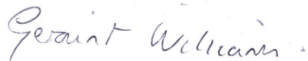
B5. Any other comments

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.

As my 4-year term ends at the conclusion of this academic session, here are some parting comments from me:

Firstly, I would like to thank all the academic and support staff at the Department of Materials for the warm welcome during my in-person visits over the past few years and for all the advice and guidance provided over the course of my external examiner appointment. It is clear that the Materials Science MEng degree scheme provides the highest standard of education in the subject area by academic staff who are world leaders in their respective research areas.

Finally, it should be noted that the time commitment required from external examiners of the Oxford Materials MEng course is significantly greater than for similar courses offered at other universities (including mine). My previous appointments at other universities (including Birmingham and Manchester) have usually entailed a 1-day annual visit to evaluate course material, interview students and attend an exam board meeting, along with the requirement to scrutinise exam papers and model answers remotely during the course of the academic session. There is vastly more effort required for Oxford, comprising a working week visit, evaluation of 20+ MEng dissertations and scrutiny of exam paper and model answers. My feeling is that the external examiner fee should better reflect the significant time commitment involved. My estimate is that on average 60 h of external examiner time is expended annually on the role, which equates to a rate which is barely at the national minimum wage. So, it is high time for Oxford University to review its fees to better recognise the effort and time commitment currently expected of their external examiners.

Signed:	
Date:	09/07/2024

Please ensure you have completed parts A & B, and email your completed form to: external-examiners@admin.ox.ac.uk AND copy it to the applicable divisional contact set out in the guidelines.



EXTERNAL EXAMINER REPORT FORM 2024

External examiner name:	Paul Midgley		
External examiner home institution:	University of Cambridge		
Course(s) examined:	Materials Part I and II		
Level: (please delete as appropriate)	Undergraduate		
Year of term of office: (please delete as appropriate)			Other year

Please complete both Parts A and B.

Part A				
	<i>Please (✓) as applicable*</i>	Yes	No	N/A / Other
A1.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience? <i>[Please refer to paragraph 6 of the Guidelines for External Examiner Reports].</i>	✓		
A2.	Do the threshold standards for the programme appropriately reflect: (i) the frameworks for higher education qualifications, and (ii) any applicable subject benchmark statement? <i>[Please refer to paragraph 7 of the Guidelines for External Examiner Reports].</i>	✓		
A3.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	✓		
A4.	Is the assessment process conducted in line with the University's policies and regulations?	✓		
A5.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	✓		
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?*	✓		
* If you answer "No" to any question, you should provide further comments when you complete Part B. ** A6. and A7. If you are in your first year of term of office you should enter select N/A / Other.				

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?*

Having had the opportunity to be part of the assessment process for the second time as External Examiner, I can say that the academic standards achieved by the overwhelming majority of students compares very favourably with those of students at my own institution and others at which I have had some experience.

- b. Please comment on student performance and achievement across the relevant programmes or parts of programmes and with reference to academic standards and student performance of other higher education institutions of which you have experience (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

Part II. At the viva, which lasted approximately 25-30 minutes, the candidates answer questions from two Examiners (or Assessors) with the Chair acting in a neutral capacity and the External able to ask questions throughout the viva, but in the main reserving questions for towards the end. As last year, this process worked very well, was undertaken in a clear, professional but friendly manner, and encouraged the candidates to discuss their results in the light of the questions. At the start of the viva the candidates were asked to take no more than five minutes to summarise their main achievements, which most did very well. At the end of the viva the final scores were agreed between the two internal Examiners with further agreement from the External. As last year, most of the time the marks were sufficiently close to enable the viva performance to broadly confirm scores. In some cases, where marks diverged significantly, the viva was helpful in indicating which way the marks should be adjusted. There is a suggestion to help that moderation process in section B4 below. As last year, overall the performance of the students was very good, although perhaps slightly poorer than the cohort last year. Some of the projects' results were at a level to be considered for writing up into a journal publication, with the student ability equal or even exceeding some first year doctoral students.

Part I. The Part I exams cover content found in the whole of the Materials course (over the first three years). The degree course taught in Oxford is wide-ranging covering fundamental and core subjects through to more advanced subjects (examined in the Options Papers). The questions were at a level appropriate for third year students, they were challenging and probing of the student's analytical and problem-solving skills. As last year, the time available to the Externals to scrutinise the scripts and coursework etc was limited but from what I saw the answers submitted by the top students were indeed outstanding and compared well to similar 'top' students at my own institution. I looked carefully also at students with marks corresponding to 2nd class and 3rd class scores. I was comfortable that those students in each class had been given the correct mark. The final scaled mark distribution looked very reasonable. As last year I can say that the achievements of the cohort are very good and the students compare favourably with others at my own and similar universities in the UK.

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.

Part II. For the Part II student thesis, there are clear descriptors given to Internal Examiners (and Assessors) regarding what aspects of the report to consider when marking. As last year, these appear to have been followed well and very careful thought and justification given to the final mark

for the thesis. The vivas were conducted in a fair, open and friendly manner with sufficient time given to students to enable them to consider their answers and with follow-up questions as needed. The time allocated to questions (ca. 25-30 mins) was sufficient to enable a confirmation of the final score. At the beginning of the viva the student is asked to spend a few minutes summarising their main achievements. A few students brought in written notes to help in this process. The viva itself was not marked separately but was used as a guide to enable the two Examiners to agree on their final marks for the thesis. The External Examiner was given ample opportunity to ask questions and to comment on the agreed marks. The Chair completed the viva report and noted the reasons for any changes to the initial marks. As last year, the whole process was completed in a fair and rigorous fashion.

Part I. From what I saw the exams had been marked in a fair and rigorous fashion. Each paper was double marked with the Examiners agreeing on a final mark (moderation) after discussion. As has been noted in previous External Examiner's reports, I would encourage the Department to continue with this double marking 'gold standard' approach if at all possible.

In reviewing the marks for Part I the marks were scaled by adding 2 marks to each of papers GP1 and OP1, the second to adjust the norm, the first to account for significant disruption to the candidates in one of the exam halls when there were insufficient desks to accommodate all the candidates. Adjustments were made also to scores for some candidates who had submitted MCEs (see also comments in B4).

The draft Part I exam papers were sent and reviewed in good time with small errors spotted and suggestions from External Examiners noted and with a formal reply to the Externals submitted shortly afterwards. Most of the model/exemplar answers were helpful and well annotated but as last year there were one or two which were lacking detail in their draft form.

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?

There were a number of MCEs that were considered very carefully by the Exam Board and decisions made clearly and professionally. As last year there was some difficulty in knowing how to 'quantify' the mitigation (i.e. how much uplift be given to the scores). I repeat my view from last year that it would help in some cases if the circumstances could be reviewed first by a medical professional with some degree of quantification then suggested to the Exam Board.

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 repeat my suggestion from last year that the Department may wish to consider small changes to the way that the Part II is assessed. Whilst the bulk of the marks will always be for the Part II thesis, there is an additional opportunity to assess the student's skills in communication, rewarding excellence in the communication of science, as well as the science itself. I understand that the candidates do make a powerpoint presentation in front of an audience of their peers and Materials academics, but that this is a formative assessment only that provides some feedback. I appreciate the value in this but fail to understand why this cannot also be summative, with the marks determined by the Examiners and feedback given to the student by, say, the Supervisor.

I feel the viva is an important part of the assessment process for Part II and in my view the viva performance could also be assessed formally and, with a suitable weighting, added in to the final mark for Part II.

It may be helpful for the Supervisor also to assess the thesis formally, to provide a mark for the thesis following the same assessment criteria given to the Examiners. This could be used either as something purely indicative to help agree a final mark, especially when there is a significant divergence between the two thesis Examiners, or to use as part of the final mark, with some suitable weighting applied.

As mentioned last year, the current scaling system is a simple addition of marks across the cohort and/or marks for a particular paper or papers. Whilst simple and transparent, I re-iterate the Department may wish to reflect on the use of other scaling systems, with the help of a statistician, to ensure the system is the fairest one possible.

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 would like to thank the Department for hosting the Externals. I was ill at the beginning of the week and joined the vivas by Teams; in that regard I thank the Chair of Examiners and Tom Heath for setting this up and to thank all the Examiners and Assessors for the patience in having me online only. (I joined in person on the final day to review scripts and for the final Exam Board meeting)

One point that was mentioned also last year was that it would be advantageous if the Department pre-selected a small sample of scripts (sorted as 1st, 2nd, 3rd class etc) for the Externals to consider. We spend a lot of time sifting through spread sheets and large piles of paper to determine which candidate scripts to consider and a pre-selection would use our time more effectively.

Otherwise, I look forward to being part of the process again next year.

Signed:	
Date:	11 th July 2024

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