CONFIDENTIAL

EXAMINERS' REPORTS 2025
MATERIALS SCIENCE (MS)

Internal Examiners' Reports

REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

The data in the table below includes outcomes for the first attempt for all candidates taking the preliminary examination in materials in 2024/25 (ie first attempts in both Trinity Term and Long Vacation sittings of the exams).

Category	Number			Percentage		
	2024/25	2023/24	2022/23	2024/25	2023/24	2022/23
Distinction	12	5	10	26	12.5	26
Pass	29	30	26	61	75	64
Fail	6	5	4	13	12.5	10

Marking of scripts

Scripts from each of the four written papers were single marked except for cases where initial marking resulted in a mark below 40%. These scripts were double-marked, with any identified discrepancies discussed, and an agreed mark awarded. Examiners initialled each page that they had marked, and an independent check was undertaken so that any pages not initialled were returned to the examiner (in-line with convention changes made in 2023/24).

B. EXAMINING METHODS AND PROCEDURES

The conventions are reviewed annually by DMAC and were last modified in 2023/24. 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.*" Moderators worked from the suggested draft questions making amendments and in several cases introducing new questions with the aim that an average diligent student could in the time allowed readily obtain a mark of about 62%.

<u>Coursework Paper</u>: 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. Although the coursework is considered as a single paper, the regulations refer to the course handbook which state that candidates must demonstrate satisfactory performance in each element of coursework (ie at least 40% in each).

<u>Computing for Materials Science (CMS):</u> The marks were reviewed and approved alongside a report from the senior demonstrator.

<u>Crystallography coursework:</u> The report from the Senior Demonstrators was received and discussed by the moderators. Marks for one of the five assessed classes were missing for six candidates. In each of these six cases the candidate had exceeded 40% even if zero marks were assigned for that class, and there were no concerns on other coursework elements. Marks for these candidates were rescaled to account for the missing mark. Moderators checked that this did not move any candidate across either a pass-fail, or pass-distinction boundary.

<u>Practicals:</u> The Moderators considered a report from the Practical Class Organiser (PCO) which outlined the overall performance in the practicals. There were no areas of concern and the Moderators endorsed the marks and penalties.

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.

Faculty should consider the following points:

1. Ensuring that training for newly appointed lecturers includes the role of setting appropriate examination questions. Establishing clearer routes probably via DUGS for feedback to lecturers who provided questions that were either not used or required substantial reworking by the moderators.

2. Improving communication of the need to pass each element of the coursework individually. Currently the exam regulations refer to the course handbook for a description of what constitutes completing coursework to a satisfactory level. The description in the handbook is spread over multiple sections and is overly long and somewhat ambiguous. It is suggested that it would be clearer to alter the exam regulations to either: (i) give a simple statement that all individual elements of coursework must normally be passed, or (ii) refer to the exam conventions (not the handbook) where such a statement should be made.

3. The exam regulations, exam convention and course handbook all state that coursework elements cannot normally be retaken, and failure of coursework will normally constitute failure of the preliminary examination. Offering no route to a resit seems overly harsh compared to written papers and out of step with regards to the general move to allow second attempts at exams. Faculty should reconsider this position.

4. Rules for applying compensation described in the conventions are not fully explicit on how they should be applied when two papers have been failed. The worked example in the conventions considers what marks are needed to compensate both of two failed papers, but does not consider conditions for compensating one of two failed papers, including the case when one of the two failures is below the 35% limit for compensation. The recent course accreditation process also looked at the compensation scheme and it that may be that a simple statement that only one paper can be compensated ought to be included in the conventions.

5. The final sentence in section 5 of the conventions reads: “The mark for any resit required due to non-attendance will be capped at a pass.” The need for this is not entirely clear as prelims marks are not transferred forward to finals examinations.

6. It is suggested that conventions for awarding distinctions be explicitly amended so that distinctions normally will be considered only for candidates not required to resit any element of the preliminary examination.

DMAC, DUGS and the education support team should consider the following points:

7. A robust and documented process for recording attendance and marks for Crystallography classes must be implemented. This is the only coursework element where the department does not retain a copy of the coursework. Scanning marked scripts after each class so that electronic copies can be retained seems possible and desirable.

8. Crystallography classes are run in Michaelmas and Hilary terms and yet marks are typically not made available to the moderators until after the written papers have been marked. This seems unnecessarily late and prevents any scope for interventions when issues are raised. The possibility of offering a resit opportunity in Trinity Term (see 3 above) would rely on timely disclosure of these marks to the moderators.

9. The report from Senior Demonstrators for the crystallography classes has recommended changing the grading scale to a reduced range of marks (0 to 5) which they argue would promote consistency in the marking.

10. Classes in Computing for Materials Science also run in Michaelmas and Hilary terms with the assessed report submitted in week 5 of Hilary Term. However, marks are typically not made available to the moderators until after the written papers have been marked. As at point 8 above this seems unnecessarily late and prevents scope for intervention.

11. Robust and documented processes need to be developed for handling cases of candidates returning from previous cohorts. In particular there is a need for timely scrutiny of (and when required action on) marks for any coursework elements completed in one year but held over to be considered with written papers in a subsequent year. It is not good practice to discover a failed coursework element from two years ago after a candidate returned to take written papers.

12. Information concerning the preliminary examinations is communicated to students using multiple routes (eg email, canvas, handbook, exam conventions, exam regulations). The wording used in these different communications has a tendency to diverge over the years, and can lead to subtle ambiguities. The situation should be reviewed with the aim to reduce the number of documents being used so as to decrease the chance for conflicting information, and to reduce the work load in maintaining accurate consistent documentation.

13. DMAC should make efforts to determine the potential causes of an apparent gender-based awarding gap for Distinctions in the preliminary examination in materials. Measures to mitigate the effect should then be devised and implemented and results monitored. Issues like this seen in data for a solitary year are often dismissed because of the small data set, however the pattern appears to be repeating on a longer timescale and deserves attention. Details of the situation are given below in part II section C.

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

46 students were registered for the examination in Trinity Term, and all candidates took the same papers.

Average marks for papers MS1 (67.5%), MS2(67.2%), and Maths (67.0%) were in the desired range, while the average for MS3 (56.3%) was markedly lower and outside the desired range. Marks for both Electrochemistry questions, and one of two questions for each of Thermodynamics, and Microstructure and Processing of Materials had particularly weak responses which might be explored further by DMAC.

38 candidates passed all papers without the need for any compensation. Compensated passes were agreed for four scripts (three for MS1, and one for MS3). This was sufficient for three further candidates to pass all written papers. Four candidates failed on a single paper (three on MS3, and one on Maths), and one candidate failed two papers (MS2 and MS3).

The five candidates with one or more failed paper all returned and took the Long Vacation resits in September. In addition, one other candidate needed to resubmit the CMS coursework in order to proceed.

Of the successful candidates in Trinity Term 11 were awarded Distinctions, which recognise especially strong overall performance.

[redacted]

Long Vacation examinations

In the Long Vacation examinations, 5 candidates passed the written papers they were resitting.

[redacted]

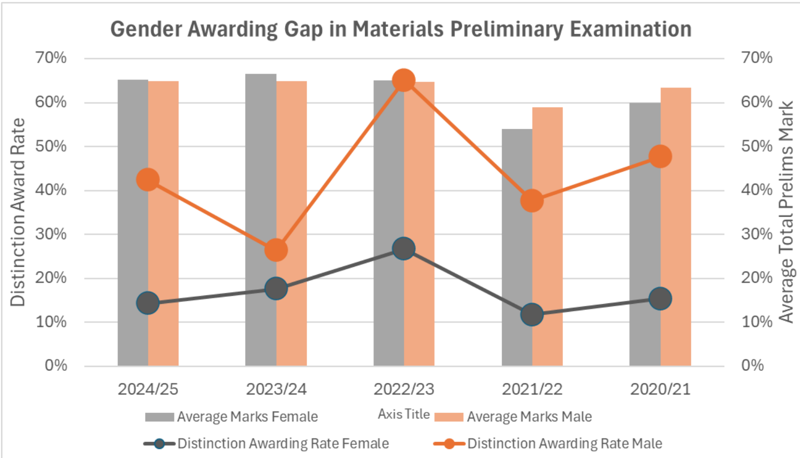
One candidate took the Long Vacation sitting as their first attempt at the preliminary examinations.
[redacted]

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

Where approved by the Proctors, 4 candidates were allowed (i) extra time on account of dyslexia / dyspraxia, and/or (ii) other special arrangements.

Of the 47 candidates 14 were women and 33 men. 2 of the 12 distinctions were awarded to women. Distinctions were awarded to 14% of women compared to 30% of men. The mean total scores were 64.9% for men and 65.2% for women.

Although the average scores do not suggest obvious gender bias, there is a strong difference in the award of distinctions with awarding rate being twice as high for men than for women. Gender-based awarding gaps have been noted in final degree outcomes in many subjects in Oxford. The last significant gender-based awarding gap for Materials preliminary examinations was in 2021/22 when again distinctions were awarded at roughly twice the rate to men than women, with less difference was seen in average marks. A similar pattern was reported in 2020/21, and in 2018/19. The pattern over the last five years shown below indicates a worrying bias. Although these marks will feed into a Division-wide examination of gender-based awarding gaps the situation should be examined by DMAC (see part I,
C-13).



C. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

This information is in the paper summaries attached.

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

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

[redacted]

Mitigating circumstances

There were four applications to consider regarding Mitigating Circumstances: Notices to Examiners.

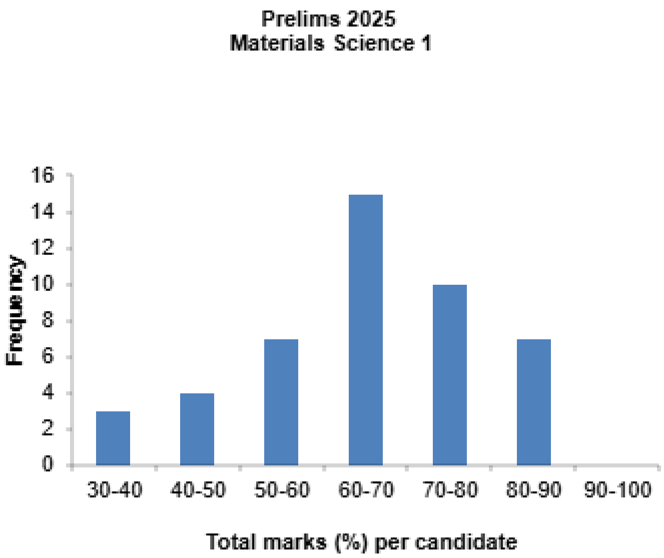
E. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Dr E. Liotti
Professor T J Marrow
Professor A. Wilkinson (Chair)
Prof. J. Yates

MS1 – Physical Foundations of Materials

Examiner: Prof. Jonathan Yates
Candidates: 46
Mean mark: 67.50
Maximum mark: 89
Minimum mark: 36

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	37	13.30	19	6
2	46	15.91	20	5
3	8	15.50	20	1
4	10	11.15	16	4
5	42	10.90	19	4
6	19	10.04	18	1
7	30	12.60	19	4
8	37	13.64	20	7



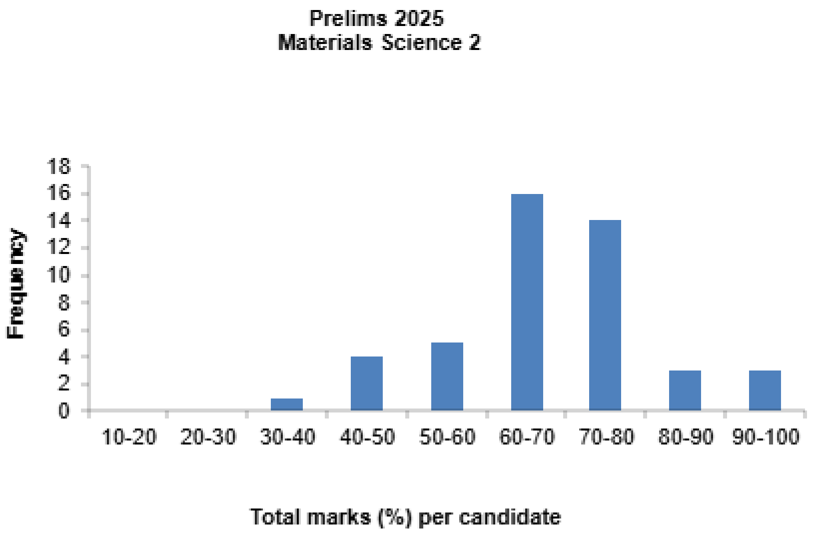
General Comments
1. **Crystalline Materials.** This was a straightforward question which tested basic crystallography knowledge. Almost all candidates could draw the required crystal structure. Many candidates lost marks on the calculation in the final two sections – these required clear thinking.
2. **Crystalline Materials.** This question asked candidates to index a cubic diffraction pattern. Many candidates did this well, and scored close to full marks.

3. **Random Processes**. This was the least popular question, but with the highest average mark. Most of those who attempted it clearly understood the Poisson distribution and so gained high marks.
4. **Random Processes**. This was also attempted by only a few candidates. This was similar to questions on the tutorial sheet. Despite this, no candidates managed to correctly answer the final part of the question.
5. **Electromagnetic Properties.** This was a question which required the application of Gauss's Law. Part (a) was covered in lectures and tutorial sheets and was mostly answered correctly. Part (b) required applying Gauss's Law to an unfamiliar situation. The techniques were covered in the tutorial sheet, and in previous exam questions. However, most candidates gave physically unreasonable answers. There were a small number of correct solutions.
6. **Electromagnetic Properties.** This question covered the generation of magnetic fields by current loops. It was not generally well answered, with students typically obtaining partial marks for each section. The derivation in part (b) attracted low scores, as few students knew how to correctly setup the problem. However, many were still able to use the provided result to answer the later parts of the problem.
7. **Quantum Theory.** This question covered energy levels. The first part of the question was very similar to a question on the tutorial sheet. The second part of the question extended the ideas to an aromatic ring. Many answers showed a vague memory of key principles, but lacked detailed understanding needed for a full answer. There was much confusion over what quantum number corresponds to the lowest energy state.
8. **Quantum Theory.** This question considered particles incident on a potential step. This was again very similar to a tutorial question – but extended it to consider an evanescent wave. The bookwork parts (a) and (b) were well done, and most candidates also managed to derive the reflection probability in (c). Most marks were lost in parts (d) and (e), rather than mathematical manipulation – these sections required physical understanding of the subject to make the required sketches.

MS2 – Structure and Mechanical Properties of Materials

Examiner: Prof. James Marrow
Candidates: 46
Mean mark: 67.22
Maximum mark: 99
Minimum mark: 30

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	37	14.55	20	5
2	37	16.46	20	7
3	13	16.85	20	12
4	26	14.96	20	7
5	27	11.15	20	4
6	39	11.40	18	0
7	32	9.75	18	5
8	19	14.70	20	6



General comments:

Question 1: Part a) done well with good qualitative explanations, some complicated part b) by not simply determining the direction of the force on the dislocation. A common error in part c) was not to explain how dislocation locally affects the Bragg condition for coherent scattering. Part d) was generally well done, though many did not explain (in terms of energy) why the dislocation interaction occurs.

Question 2: Popular question, generally well done. Common errors included lack of clear explanation of how the grain boundary structure affected the grain boundary energy or poor diagrams for this, and failure to calculate the number of dislocations required for the given misorientation.

Question 3: An unpopular question, but done well by those that attempted it. Common errors were inaccurate schematic diagrams of the volume/temperature relationships for cooling of glassy and crystalline materials, and lack of clarity on the network formers.

Question 4: Generally well done, though many did not fully explain the type of intermediate phases, and the descriptions of compound types were sometimes shallow and lacking in detail. Sketches of the crystal structures were generally correct, as were explanations of the effects of ion size ratio on coordination.

Question 5: Unpopular question, though some produced full answers. Common errors were completely incorrect shear force and bending moment diagrams derived for simply supported beam, derivations of the maximum deflection that started well, but did not clearly define or correctly use the boundary conditions, and answers that did not explain where the maximum bending stress would occur.

Question 6: Popular question, done well by some. Common errors were incorrect construction of Mohr's circle given the engineering strains, numerical and algebraic errors in the calculation of normal and shear stresses, and failure to use the provided information to calculate Poisson's ratio

Question 7: Although a popular question, it was generally not well done. The identification of the 3 materials was often incorrect with poor understanding of the yield point in Carbon steels, brittle fracture of cast iron and ductile behaviour of fcc crystals. Many calculations of simple tensile properties were very inaccurate and lacked units (and so were meaningless). There was substantial confusion about fracture energy and work of fracture, and the calculations of the latter from the figure were very inaccurate (by several orders of magnitude)

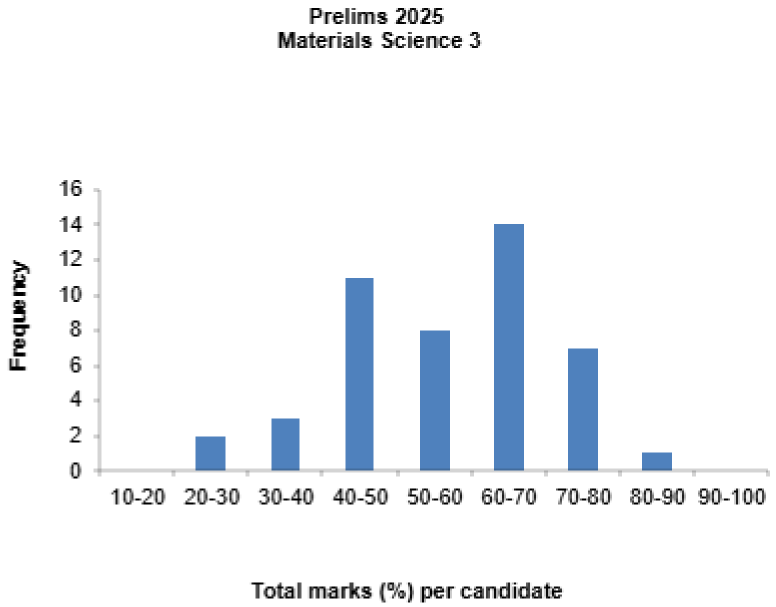
Question 8: The derivation of Griffith equation was generally well done, as was the description of mode II fracture. Many calculations of fracture toughness were correctly done, but in part d) many neglected either fibre pullout or interface fracture as toughening mechanisms.

MS3 – Transforming Materials

Examiner: Dr. Enzo Liotti
Candidates: 46
Mean mark: 56.28
Maximum mark: 82
Minimum mark: 22

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	36	8.50	15	2
2	19	7.74	15	1
3	44	13.18	19	3
4	21	9.00	17	1
5	41	13.44	18	4
6	14	6.50	17	0
7	40	12.08	19	1
8	15	16.13	20	11



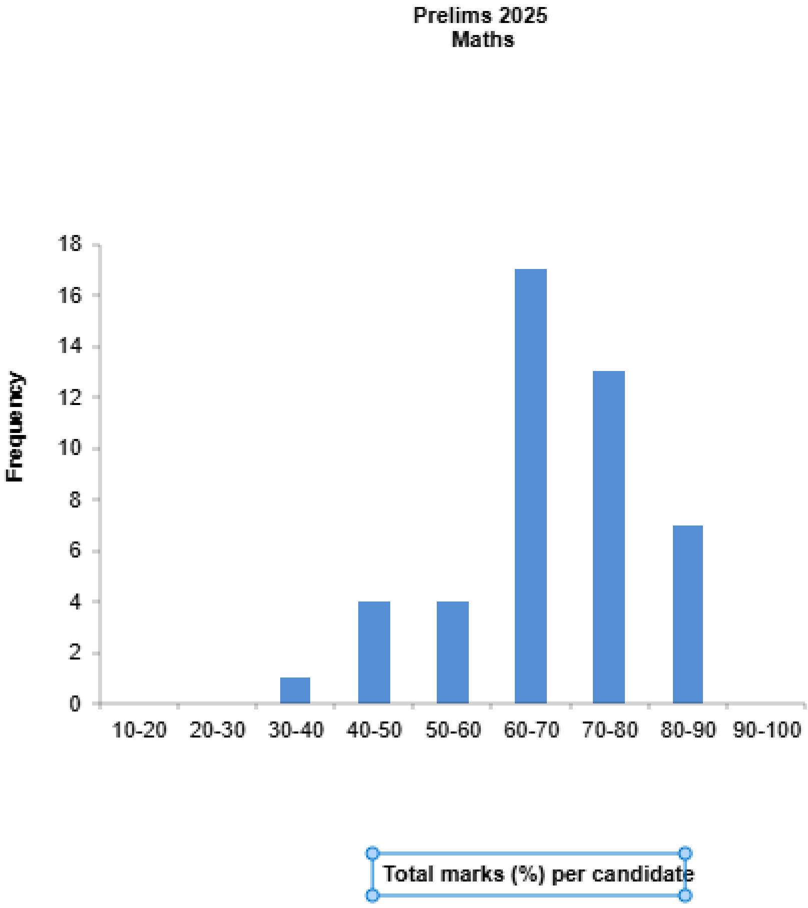
General comments:

1. **Electrochemistry**: popular question on fuel cell operation with an exercise to calculate the standard potential at high temperature. Overall, it was not well answered by most of the students, particularly part (d), which accounted for half the marks, was correctly answered only by few candidates.
2. **Electrochemistry**: less popular question, which as the first was not well answered. Most of the candidates did the wrong calculation in part (b), which was half the marks.
3. **Microstructure and processing of materials**: this was the most popular question, generally well done, with some candidates scoring close to full marks. It was a straightforward question on the basic knowledge and understanding of binary phase diagram.
4. **Thermodynamics**: less popular question answered by less than half of the candidates. Answers were either good or very poor, in many cases just picking up a few marks.
5. **Thermodynamics:** Another popular question, which was well answered by almost all candidates. One exception was part (d), where most of the candidates misinterpret the Ellingham diagram.
6. **Microstructure and processing of materials**: low popularity question on the control of Al-Si alloy microstructure and the worst in term of average marks. Of the fourteen which attempted it only one got good marks (17) all the others were below 10 marks.
7. **Microstructure and processing of materials**: very popular question on how to control the microstructure of steel and mullite. Mostly good answers.
8. **Nanomaterials:** not very popular question on the LaMer mechanism of nanoparticle formation, only one third of students attempted. Best average marks, generally very good answers except a few students which submit incomplete answers.

Maths for Materials Science

Examiner: Prof. Angus Wilkinson
Candidates: 46
Mean mark: 67.0
Maximum mark: 89
Minimum mark: 34

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	46	7.35	8	2
2	46	7.63	8	3
3	46	3.00	8	0
4	46	6.03	8	0.5
5	46	4.23	8	0
6	46	6.72	8	2
7	46	5.96	8	0
8	46	5.33	8	0
9	46	4.67	8	0
10	46	4.98	8	0
11	30	13.97	25	2.5
12	43	18.21	25	3
13	7	7.79	18	3
14	43	16.31	25	3.5
15	45	18.44	25	4
16	12	16.04	25	1



General comments:

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

1. Straightforward inversion of a numerical 3 by 3 matrix answered correctly by most candidates.
2. Straightforward eigenvalue and eigenvector of a numerical 2 by 2 matrix answered correctly by most candidates.
3. Integration by parts for induction formula. Many struggled with this question often failing to get started or making basic errors in integration. Though 7 candidates achieved full marks.
4. Complex numbers question which split cohort with 22 candidates achieving full marks while others to sketch two curves on Argand diagram.
5. A curve sketching problem for a trigonometric function that many found difficult, despite guidance in the question. 6 candidates achieved full marks.
6. Partial differentiation question which was generally answered well with 20 candidates achieving full marks. Weaker candidates often had inconsistency with which variable should be held constant.
7. Ordinary differential equation which most could demonstrate was exact though weaker candidates then failed to find the solution.
8. Two power series expansion problems. There were mostly reasonable attempts at the first of these, but attempts at the second were markedly weaker. 11 candidates achieved full marks.
9. Two limits problems. Again, the first had reasonable attempts, but most attempts at the second were weak with many not obtaining any mark for this part.
10. A vectors problem linked to crystallography of partial dislocations in the fcc structures. Sketches of plane and direction generally good, though many struggled to identify <112> directions need to be in a specific (111) plane.

Section B:
Long form questions with candidates selecting to answer four out of the six available questions. Each question was marked out of 25.

11. Question combined convergence of sum of series and imaginary numbers. Question uptake as expected from random sampling, but with second lowest average mark in section B well below paper average. Section (c) which introduced complex numbers was the weakest section. Few scored first class marks, though one candidate did achieve full marks.
12. A fairly standard partial differentiation question attracting all but 3 candidates. One of the highest scoring questions. Pleasing to see that this topic seemed well understood by the cohort.
13. Multiple integration question in two-dimensional plane. By far the lowest take up of section B questions, and also the lowest average mark at 31%, though one candidate achieved above 70%. Many failed to set up the multiple integral in particular making error with the limits. There were many marks of zero on parts (c) and (d). Knowledge of bending moments was assumed.
14. Popular question on various differential equations answered by all but three candidates. Average mark at 65% is similar to paper average. Part (b) stood out as the weakest with many candidates failing to understand and implement the suggested substitution.
15. Question on eigenvalues and eigenvectors that was tackle by all but one of the candidates, and also recorded the highest average mark in section B. The more general part (a) was poorly answered, but the numeric parts (b) and (c) were very well answered.
16. A vector fields question that was not popular with only 12 attempts. The initial three parts were mostly answered very well, but answers for parts (d) and (e) were weak.

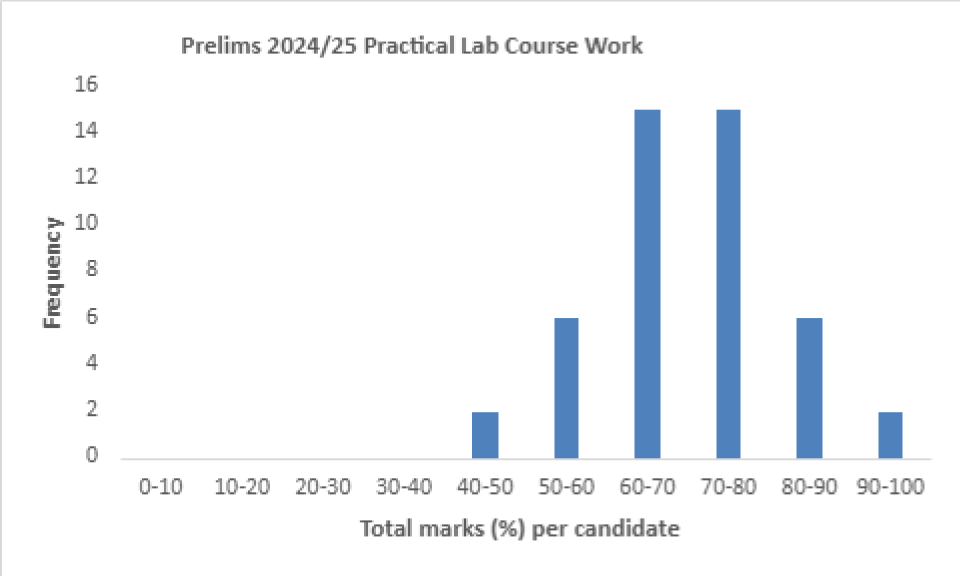
Practical Lab Coursework

Candidates: 46
Mean mark: 69%
Maximum mark: 96%
Minimum mark: 42%

Detailed comments on the coursework are as follows:

Lab No Lab Book Assessment (/3)	Average Mark	Highest Mark	Lowest Mark
1P3	2.67	3	2
1P4	1.98	3	1
1P5	2.13	3	1
1P6	1.78	3	1
1P7	2.17	3	2
1P8	1.87	3	0
1P9	2.11	3	0
1P10	2.04	3	1

Lab No Lab Report Assessment (/13)	Average Mark	Highest Mark	Lowest Mark
1P3 (not assessed)	n/a	n/a	n/a
1P5	7	8	6
1P6	8.95	12	6
1P7	6	6	6
1P8	9.16	13	2



Report on Practical Marks for the Prelims Moderators June 2024 1st year Practicals
Report on Practical Marks for the Prelims Examiners Trinity 2025

1st year Practicals 2024-25

I have reviewed the marks from the 1st year Practicals 2024-25. Overall the year ran smoothly and my thanks are due to Daniel DeBrincat for all his work standing in for Diana Passmore.

The laboratory notebooks were assessed for 8 of the practicals with an average of 2.06 out of a maximum of 3 which is in-line with the expectation for this assessment. Note that the marker for 1P8, when the zero marks for some candidates was noted, states that they use the full scale for marking.

Long reports were submitted and summatively assessed for two of the practicals, with an average score of 9.02 out of a maximum of 13, or 69.4% which again is in-line with expectations.

The average percentage score for the laboratory class is 69.2%. All students are deemed to have passed the practical class.

Specific cases and recommendations for penalties are listed below.

[redacted]

[redacted]

Plagiarism: None reported

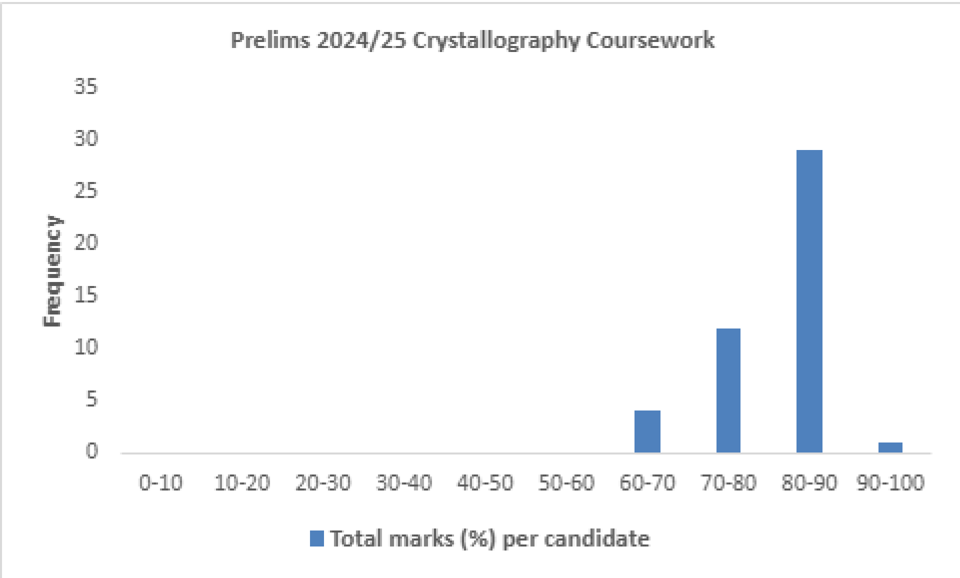
Practical Class Organiser – Pete Nellist
June 2025

Crystallography Class Coursework

Candidates: 46
Mean mark: 81.7%
Maximum mark: 90.6%
Minimum mark: 64.4%

Detailed comments on the coursework are as follows:

Demo No	Average Mark	Highest Mark	Lowest Mark
D1	81.24	99	37.50
D2	83.31	96.00	53.00
D3	61.72	90.20	0.00
D4	70.05	91.60	50.00
D5	87.28	100.00	72.70
D6	90.55	100.00	29.87



To the Chair of Prelims, Materials Science
Crystallography Marks

This year the crystallography classes were supervised in person by Dr Ali Mostaed, Dr Alexandra Sheader, Miss Xinrui Huang and Mr Michael Furlan. A team of four works well for the large class size. Since it is crucial for the demonstrators to collaborate and collectively review the sheet before the sessions commence, they gather in person a few days prior to the sessions to individually discuss the completed sheets. This practice ensures a unified and coherent response to the students during the sessions.

The course consists of six classes, three in the Michaelmas term and three in the Hilary term, designed to support both the Crystallography lectures and Structures of Crystalline and Glassy Materials course. This year, while the material emphasised in each class was unchanged compared to previous years, the workshops in Hilary were completed in a different order to better reflect the lecture content. As in previous years, during the sessions the demonstrators actively engage with the students, fostering an environment that prioritizes a conducive learning experience rather than simply focusing on assessment. Through their interactions, they create an atmosphere where students feel encouraged to participate, ask questions, and explore the subject matter more deeply.

Figure 1 depicts the histogram displaying the distribution of students' grades during the 2024/25 academic year. Taking into account the guided nature of the class, as well as the availability of lecture notes and textbooks, a practical score of 70% or below indicates that the student faced challenges during that specific practical session. Nevertheless, as illustrated in Fig. 1, the vast majority of students performed well in their classes, with an average grade of 81% across the entire year group.

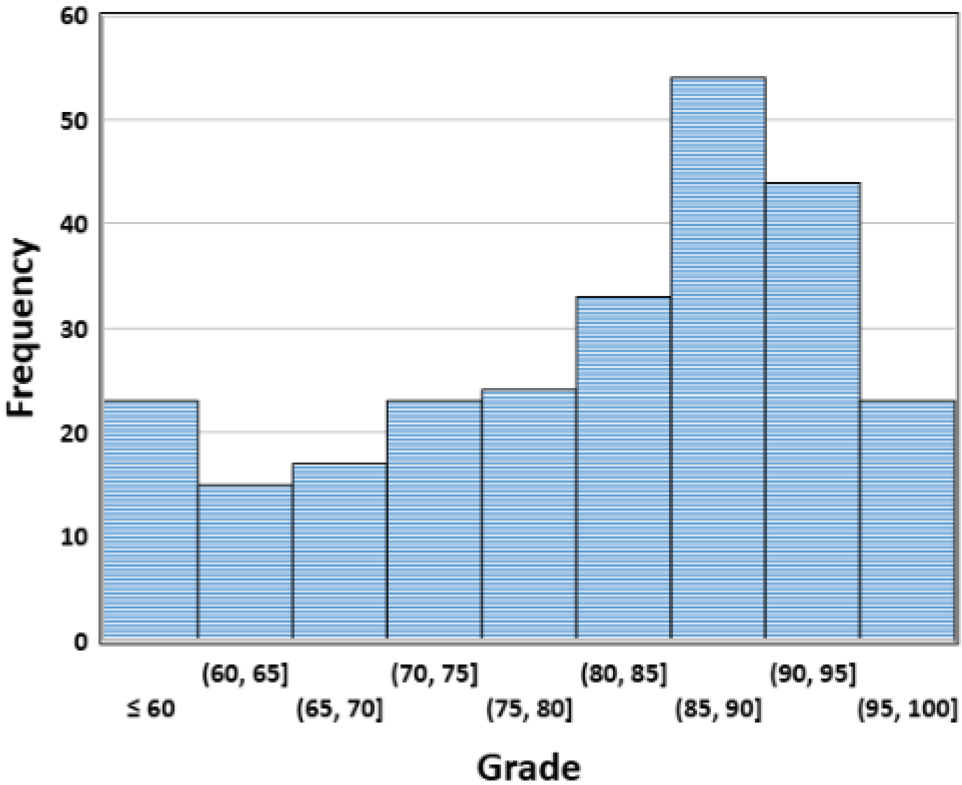


Fig. 1. Histogram representing the grades of the students during the 2024/25 academic year.

Due to an unfortunate technical glitch, the marks for six students for Class 3 failed to be recorded in the online spreadsheet used to track marks. To avoid unfairly penalising these students, it would be advisable to discard this class when calculating final grades for these students, and instead take the average of the other four pieces of assessed work in this course element. As Class 3 had the lowest average mark across the five assessed workshops, this remedy would be unlikely to disadvantage those affected.

Each of the two senior demonstrators is responsible for evaluating half of the worksheets during each practical session. While they strive for consistency in their marking approach, slight variations of a few percent in their assigned grades may occur. To enhance overall consistency, it is advisable to adopt a grading scale ranging from A to F or 0 to 5, rather than relying solely on numerical values in the next academic years. This adjustment can promote greater uniformity and clarity in the grading process, ultimately benefiting the students' understanding of their performance.

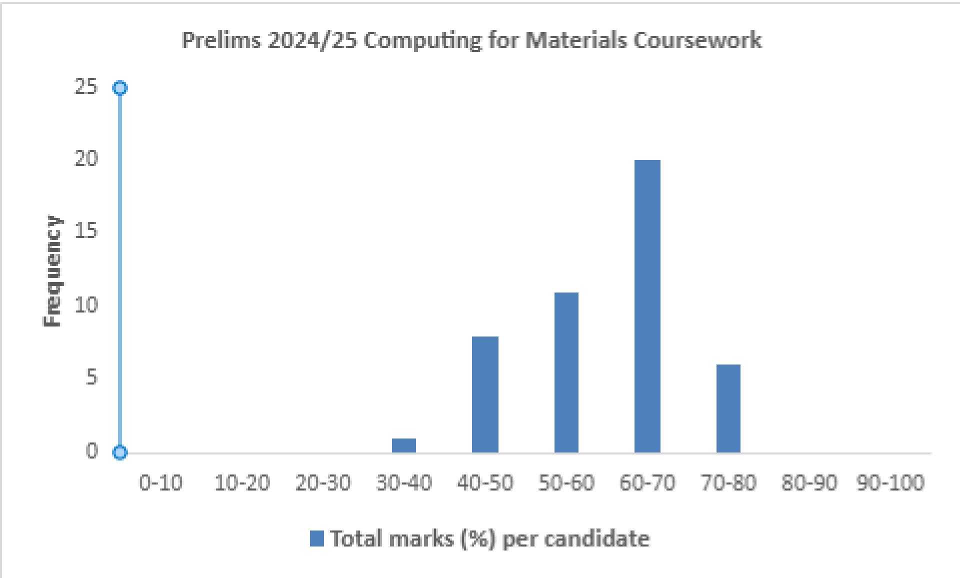
Yours Sincerely,
Dr Alexandra Sheader
Dr Ali Mostaed

Computing for Materials Science

Candidates: 46
Mean mark: 58.8%
Maximum mark: 75%
Minimum mark: 35%

Detailed comments on the coursework are as follows:

Exam Parts	Average Mark	Highest Mark	Lowest Mark
Code	24.59	30	7
Introduction	4.50	7	3
Results	25.00	40	10
Conclusion	4.74	7	2



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

<u>Computing for Material Science Report 24-25</u>

The teaching was held in person across two class rooms. Most students found the worksheet provided relatively easy and would finish in approximately two thirds of the allotted time. Typically, students only asked 1-2 questions over the 4 sessions. It is thought that the programming ability of new intakes is increasing, and we are planning on developing the course to better handle incoming student abilities.

A dedicated email was provided to answer any questions about the report, but only a handful of questions were received. No in person session for questions was offered. The average of the reports was relatively low, which was mainly a reflection of the lack of investigation into the provided problem and poor presentation. Most students only minimally altered the provided code and performed the basic analysis described in the outlined problem. All students provided scripts which could be run with MATLAB, which meant that all students passed the minimum grade.

By Dr Zachary Goodwin 2nd May 2025

Examination Conventions 2024/25
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 2024/25. 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

* for the 2024-25 examinations the Nominating Committee comprised Prof Assender, Prof Marrow & Prof. Speller.

practical 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 2024/25 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 2024-25 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 2024/25 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 + 2x40 + **3**×(4+2)} 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 circumstances 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 circumstances 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 2025 are: Dr Enzo Liotti, Professor Jonathan Yates, Professor James Marrow and Professor Angus Wilkinson (Chair). 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 2025:

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		
	2024/25	2023/24	2022/23	2024/25	2023/24	2022/23
Distinction	9	n/a	n/a	26	n/a	n/a
Pass	34	44	46	100	100	97.8
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 2025 Exams were sat in closed book format in Examination Schools, as had been decided to be the preferred format by Faculty in MT 2024. 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 2024 exams, the University operated no exam paper corrections process during the 2025 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 34 candidates for the examination, all of whom were awarded Honours with the exception of four 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 or a module on Atomistic Modelling.

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 in OP1 from a discontinued course and two additional questions in a separate section in OP2 for a course which had moved paper.

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, 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.

No scaling was applied to the exams. There was a more pronounced tail to the marks than had been observed in recent years, with a few candidates performing uncommonly poorly. This was deemed to be responsible for the lower paper averages. The mark distribution excluding this tail was comparable to previous years.

The raw overall mean mark for Part I was at 62.72; paper averages for all papers were lower than this (GP1 60.5, GP2 66.16, GP3 56.75, GP4 57.74, OP1 59.92 OP2 60.80). The raw paper mean mark was 60.18%.

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

The performance of the male and female candidates was as follows:
Written Papers Averages – M 61.26%, F 58.52% (Overall 60.13%)
Coursework Averages – M 69.47 F 71.66 (Overall 70.32%)
Overall Part I Averages – M 63.32%, F 61.81% (Overall 62.69)

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

	Overall mark		Written Examinations		Coursework	
mark (%)	Male	Female	Male	Female	Male	Female
20-30	0	1	0	1	0	0
30-40	1	1	1	1	0	0
40–50	3	3	3	3	0	0
50–60	4	0	4	0	0	1
60–70	8	5	8	5	9	4
70–80	4	4	4	4	10	8
80–90	0	0	0	0	1	1
90-100	0	0	0	0	0	0
Totals	20	14	20	14	20	14

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, four applications for consideration of Mitigating Circumstances: Notices to Examiners were received.

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.

[redacted]

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. R. S. Bonilla	Prof. P. Midgley (External)
Prof. M. Galano	Prof. K. O'Reilly
Prof. C. Grovenor	Prof. C. Patrick
Prof. R. Goodall (External)	Prof. M. Pasta
Prof. N. Grobert	

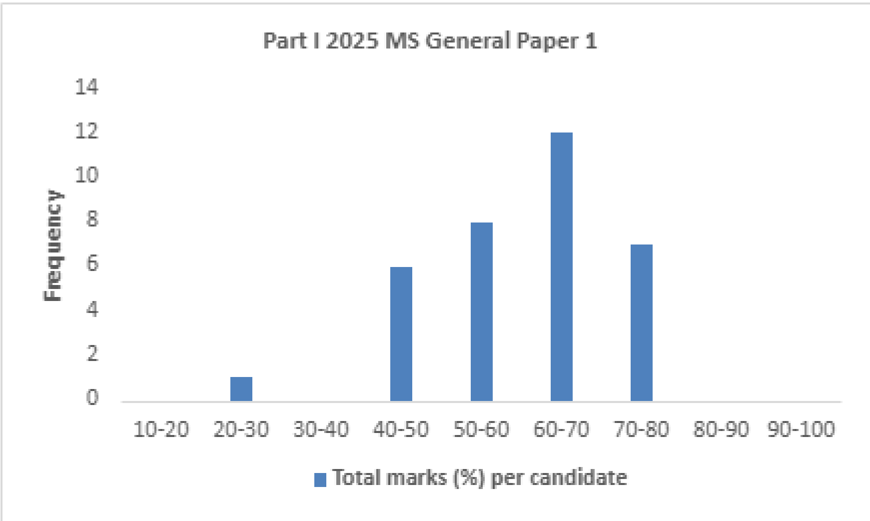
Professor Armstrong is to be thanked for stepping in at short notice to help mark one of the papers when the appointed Examiner was unable to do so due to personal circumstances.

GP1 – STRUCTURE AND TRANSFORMATIONS

Examiner: Marina Galano
Candidates: 33
Mean mark: 60.50
Maximum mark: 80
Minimum mark: 23

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	33	13.10	18	4.75
2	31	13.81	19.5	3.75
3	28	10.80	16.75	3.5
4	5	9.65	15	5
5	9	12.83	17	10
6	5	11.60	14.5	9
7	32	11.58	16.5	5.25
8	22	10.98	17	3.5



General Comments

The performance of the paper was satisfactory with a well balance set of results. The mean mark was slightly lower than last year. Questions 1, 2, 3, 7 and 8 were selected by a large number of students whilst questions 4, 5, and 6 were only taken by a few. Nonetheless, in all cases marks were well balanced with an expected distribution of marks and some students achieving the high marks.

1. This corrosion question covering aspects of Pourbaix diagrams was taken by all the students in the cohort with a good distribution of marks and with an average in the 2.1 bracket. Most could discuss paint issues but lacked specificity on why it might fail to adhere. In c) many missed the cost effecient part.

2. Another popular and broadly well-done question corrosion question. The marks were well distributed with some marks being the highest marks achieved in the paper. The calculations were well done, and Evans diagrams constructed. Few noticed the answer to part b) iii was merely the Tafel slope. But many calculated it.

3. This question on “Materials end of life” course was very popular answered by 85% of the students. The question was a discussion type question based on bookwork from lectures that needed to be newly applied to the comparison of materials types. This question has a good distribution of marks with the highest mark reaching 84%. It was noticed that in part a) ii there was a lack of comments on range of compositions; part b) was generally the best answered section and; in part c) there was lacking of understanding of the value of some elements.

4. This question was one of the least popular questions taken only by 15% of the students. The question was mostly analytical on “Processing for control of Materials properties and performance”. Some candidates achieved reasonable marks, but the highest mark was one of the lowest in the paper 75%. All struggled with part d) with most having no idea how to proceed.

5. This question was on the “Processing for control of Materials properties and performance” lecture course discussing honeycomb and foam structures. It was another unpopular question, taken by 27% of the cohort. With the lowest mark being 50% this question has the highest lowest mark in the paper. There were some good attempts, and some candidates had clearly engaged with the material. Those that struggled did not know the basics about porous materials and could not link it to other areas of the course. No candidate had good answers for part e)

6. This question was another unpopular question taken only by 15% of the students. The question was on welding and got the lowest higher marks in the paper 72.5%. In part c) students could have benefited by referring back to the simplified equation developed in b).

7. This question on composite materials combined a discussion part and an analytical part. It was a very popular question taken by almost all the students and with a good distribution of marks. In part b) arguments were often too general or not specific enough to composites. Regarding part c); not everyone noticed that the data in the table was in K.

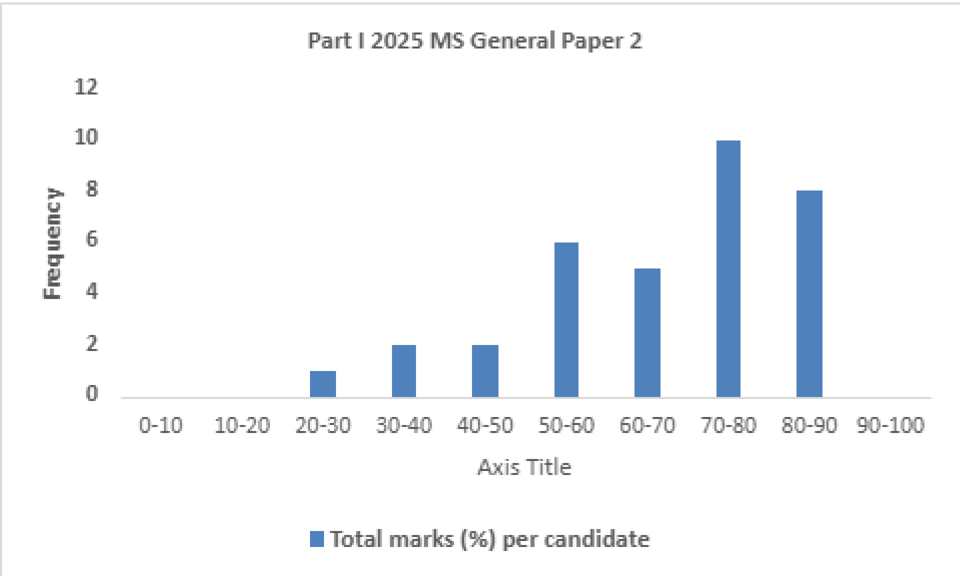
8. A descriptive question on carbon fibres properties and manufacturing. The question was taken by 67% of the students with a good distribution of marks. Part a) attempts were fine in general. In part b) Few mentioned graphite sheets. For part c) some candidates did get both reducing amount of initiator and emulsion polymerisation. Part d) was poor on applicability.

GP2 – ELECTRONIC PROPERTIES OF MATERIALS

Examiner: Prof Sebastian Bonilla
Candidates: 34
Mean mark: 66.16
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	32	12.49	18	5
2	30	14.06	19.25	4.5
3	31	13.22	18.75	6
4	4	15.75	18.5	10.25
5	27	14.86	20	9
6	13	13.73	17.25	9
7	24	12.25	18	3.5
8	8	10.19	16	4



General Comments

This year’s paper had an average mark of 66.16%, the highest in the past five years, 4 marks higher than last year and 8 marks above two years ago (before scaling), and it was also the highest average across all six exam papers. The distribution of marks showed a heavy tail on the low end, reflecting an unusually large number of students performing poorly across the board, but it was also skewed towards high marks, with at least 18 students scoring above 70%, indicating that strong performance was very much achievable. As is now standard for the GP2 exam, the questions required deep analytical thinking rather than simple recall from lecture notes, and students were expected to give short but carefully reasoned answers. The choice of questions was fairly spread, with a clear preference for those from the electronic structure and the electrical and optical properties courses—an understandable trend, as students performed well in the electronic structure section. Interestingly, even though fewer students attempted the semiconductors questions, performance in that subject was particularly strong. The strong overall performance may reflect the benefits of a now well-established teaching team that has delivered all four courses for several years.

1. This was the highest attempted question, with close to 63% average. Students clearly grasped the concept of reciprocal space and primitive unit cell, but struggled heavily with stating nearing neighbours and the key boundaries points in the Brillouin zone. The Fermi energy question was again very well received with reasonable calculations of the Fermi surface radius, but most students could not visualise the shape of the Fermi surface in Cu inside of the Brillouin zone.

2. Another well liked question, attempted by 30 out of 34, and averaging 14 marks. Parts a-c were all well answered, but then students found difficulty with sketching and identifying properly the band structure of this system, and, while most students knew the relationship between E-k and effective mass, there were a large number of mistakes in doing the derivative and thus few people reached the right answer. Finally, reasonable analysis were provided for the comparison to an equally spaced chain, both in terms of the tight binding solution but also its meaning in terms of energies.

3. The second highest attempted question had an average of 13.22 marks, showing students had a reasonable attempt. Parts a, b, and c,ii, were all answer correctly by most students showing that the basic relations for intrinsic and extrinsic carrier concentrations were well understood, but most students failed to see that the high dielectric constant and low effective mass reduce the electron's binding energy to a phosphorus dopant in a semiconductor. Field screening was identified. The biggest issue here was recognising how to use the principle of charge neutrality here, Qpos=Qneg, so few marks were gained in c,iv.

4. The least popular question with only 4 up takers, but the question that had the highest average of all, with >78%. The four students clearly knew well they could attempt this devices question. Not that dissimilar to the problem sheet, students needed to navigate the design of a photon detector and identify the relationship between bandgap and absorption. All students managed this well.

5. The second most popular subject was electrical and optical properties of materials. The questions were primarily descriptive, with a small calculation for the electrical conductivity of an ionic crystal. Students scored highly on the first two section, describing conductivity mechanisms and polaron conduction, but had some issues with the calculation, primarily in spotting which approximation to use - in the high temperature intrinsic generated vacancies are dominant, so we can ignore the next/N.

6. This question probed knowledge on optical properties of materials. Slightly less popular, the questions were similar to the problem sheet, including polarisation and basic light-matter interactions. Students performed well across the board except for part b, where almost no one provided the key reasons covered in the lectures for why human eyes sensitive to the 400 nm to 700 nm part of the electromagnetic spectrum.

7. This question, on magnetic properties of materials, had good uptake, but performance was on the low side (12/20 marks). Students struggled heavily with comparing aluminium and copper’s susceptibility. They key being spin vs orbital response, providing para or diamagnetic behaviour. There was also a lot of difficulty estimating the magnetic moment per atom cobalt, thought the equations needed were all part of the tute sheet, and just required to know the volume of the hcp unit cell. Last, students underperformed in explaining why the magnetic moment of a cobalt atom differs from that metallic cobalt.

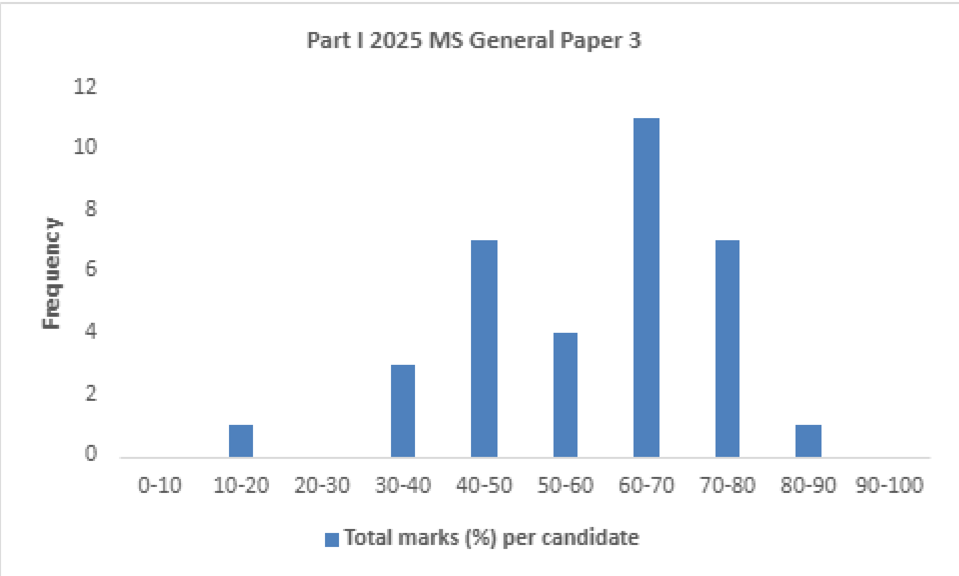
8. The last question of the exam, typically less popular as left to the end, but also poor performance in comparison with an average of 10.19 marks. The question addressed key concepts in superconductivity including critical temperature and field. Significant difficulties were found in stating why Bc for V was significantly higher than that of Al and Pb. Students could get to the general solution to London’s equation, but found it hard to apply a variety of conditions, and visualise the magnetic fields in and next to the superconducting slab. Not hugely dissimilar to the problem sheet, but still with confusion about London’s solutions to a variety of situations.

GP3- Mechanical Properties of Materials

Examiner: Chris Grovenor
Candidates: 34
Mean mark: 56.9
Maximum mark: 84
Minimum mark: 18

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	32	15.05	19	6
2	16	7.70	15	0.5
3	30	13.84	18.25	3
4	30	10.29	17	3
5	8	13.03	19	6
6	15	8.77	15.5	2.25
7	14	5.86	11	2
8	25	11.58	19	1



The paper was based on questions from the lecturers, some of which were substantially modified during the paper setting exercise in consultation with the lecturers to ensure that it was clear to the candidates what was required to achieve the marks for each section. The question style included several examples of presenting real experimental data from which the students were expected to explain trends with physical mechanisms or to extract key values. The explanations were in general less successful than the more numerical answers.

A very wide range of overall marks were achieved by the candidates, but the mean paper mark of 56.9% was considered acceptable, and no scaling was considered. A few candidates showed very little understanding of this material, and could make almost no progress in any of the 5 questions attempted.

1. This was a very popular question on Weibull statistics for the analysis of the failure of ceramic materials. It was based on material familiar from the lectures and tutorial problem sheets, and all the sections were done very well by many candidates, with an impressive average over 15/20.

2. A much less popular question on the fracture toughness of a quenched and tempered steel, based on real experimental data presented in a series of figures. The answer was broken down into lot of of small sections, each requiring a specific interpretation of the data shown. This was intended to help the students focus on precisely what was required in each section, but may have made the question look long and unattractive. The individual sections tested aspects of temper embrittlement that should have been familiar from the coursework, but the average mark of only 7.7/20 showed that the candidates were not confident in explaining the factors that lead to variations in fracture toughness in steels.

3. A popular question on fibre reinforced composites that generated a wide spread of marks and an average of 13.8/20. This question asked for derivation of the compliance tensor and then 2 separate calculations of strains in different composite structures using the tensor. Many candidates were confident in how to go about the tensor derivation, but some numerical errors reduced the scores in the later sections.

4. Another popular question on elastic properties. The first 2 sections on radial and hoop strains and stresses were extremely familiar to the students from the coursework, and were done very well by most candidates. The second half on stress states in SiC-SiC composites was done much less well because it was a less familiar situation, although it was based on a problem solved in the lectures. Many of the candidates could not establish the boundary conditions accurately, nor use Mohr’s circle appropriately. This resulted in the rather low average mark of 10.3/20.

5. An unpopular (only 8 attempts) question on creep in SiC, perhaps because of the rather complicated figure from which the students were asked to extract numbers. In fact, the average mark was above 13/20 for those who did attempt it. Part a) i was essentially bookwork and was answered well by many, though some neglected to explain how diffusion aided dislocation movement. Part a) ii was easily done by those who used the simple power law relationship between strain rate and stress, and noted the relative changes of these. The second half of the question required the candidates to extend mechanisms of creep failure discussed in general in the lectures to a ceramic, and to identify intergranular creep as the likely mechanism for low stress, high temperature failure. Part b)i had quite a few errors in calculation of the shear stress, which required thin-walled approximation and force balance, with some not considering the shear modulus or justifying that temperature would not affect the shear modulus. Part b) required some thinking on the creep rate at the temperature and stress of interest and the possible creep mechanism, but most answers were quite limited in depth.

6. 15 attempts at a question on fatigue based on experimental data. This was not done well, with an average below 9/20. Most candidates recognised in part a that this was a cyclic loading experiment, but few realised that uniaxial tension/compression was required (not bending) or proposed sensible ways to monitor and control the strain. The descriptions of monotonic and cyclic hardening were often shallow and few properly explained these differences in terms of dislocation behaviour. In part b) calculations or measurements from the chart or argued judgements for the relative magnitudes of elastic and plastic strains were largely missing (plastic strain was negligible), and identifications from the figure of significant features and discussion of the transition from stage I to stage II for short fatigue cracks was often incorrect (these were not striations), or very limited in detail with a common misconception that grain boundaries are weak.

7. 14 attempts at a question on forces on a mixed dislocation that had by far the lowest marks average, below 6/20. The candidates needed to know the form of the stress tensors for edge and screw dislocations, and then to use the Peach-Koehler equation to evaluate and sum the forces. Very few made very much progress in what was quite a long question because of the number of terms that need to be considered for both edge and screw components. It was disappointing that almost all the candidates chose wrongly in the last part on the relative energies of the two types of dislocation.

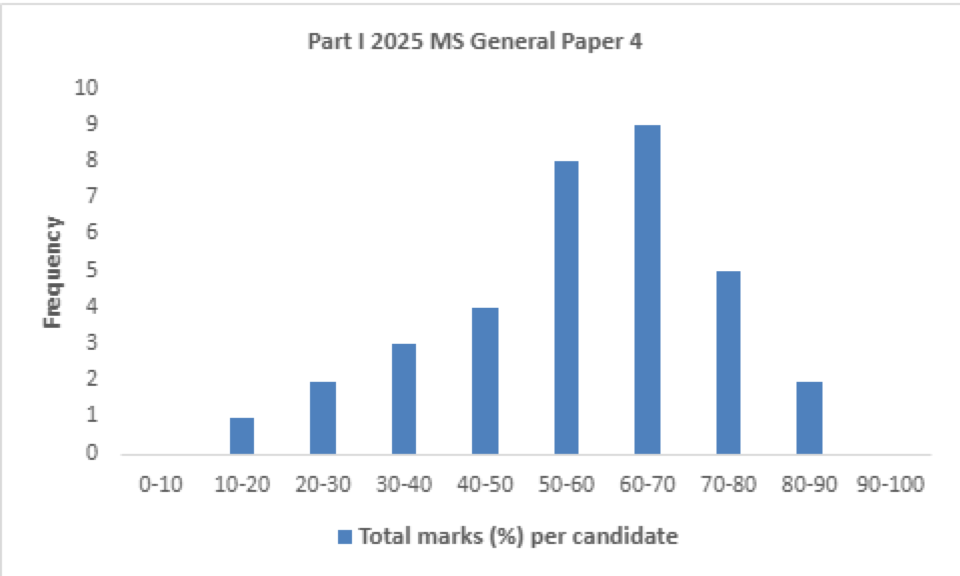
8. A relatively popular question on the effect of rolling and grain size on the dislocation content and mechanical properties of metallic components, with an average mark of 11.6/20. In part a there were a number of rather vague descriptions on the interplay of grain size and work hardening where the students struggled to give a coherent narrative on how these interact. The calculation of the Hall-Petch coefficient in part b was simple, and was done effectively by most of the candidates.

GP4 – ENGINEERING APPLICATIONS OF MATERIALS

Examiner: Mauro Pasta
Candidates: 34
Mean mark: 57.44
Maximum mark: 85
Minimum mark: 17

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	25	11.72	16	6
2	18	9.00	17	2.5
3	19	12.34	18	5.5
4	16	11.89	19.25	3
5	24	12.08	19	1
6	21	11.02	18	2.5
7	26	11.47	18	1.75
8	21	12.55	20	0.5



General Comments

The GP4 paper achieved an average mark comparable to last year (57.76 vs. 60.84), with the lower average largely due to a few candidates performing uncommonly poorly. However, the presence of top marks, two in the 80–90 range and five in the 70–80 range, suggests that the questions were well calibrated. The paper followed the faculty's new policy of open-book style questions, which required not just definitions but also reasoning and links to other aspects of the subject. Overall, a lack of deeper understanding of core concepts was evident when candidates were asked to apply these concepts to new problems. No correlation was observed between the popularity of questions and the marks achieved.

Questions

Q1. Part (a) asked candidates to describe the process of precipitation. Most were able to outline the nucleation, growth, and coarsening stages. The best answers were logically structured and supported by appropriate diagrams. Part (b) required candidates to match four images of experimental data to alloy descriptions. Most candidates successfully identified the Ni superalloy and matched the APT data to the complex steel composition. However, the FIM image caused significant confusion, and many candidates misidentified the Al–Cu and Fe–V–Al alloys, despite the presence of similar images in the lecture materials.

Q2. This question was generally poorly answered, apart from a small number of very good responses. Few candidates were able to describe the process of constitutional supercooling with confidence or provide clear diagrams. Part (b), which focused on microsegregation, was covered in lectures, but many candidates showed confusion about solute redistribution during solidification and failed to use the provided parameters sensibly. The back-segregation of phosphorus, due to increased activity caused by Mn and Si in interdendritic regions, was recognised by very few.

Q3. Very few candidates were able to accurately describe glissile transformations, with some even failing to mention dislocation motion. Parts (c), (d), and (e), which addressed grain boundary segregation, were generally better handled. However, many candidates poorly explained the symbols in the isotherm equation, and only a few used the simple diagrams discussed in lectures to explain solute drag.

Q4. This question focused on vibrational dispersion relations and their implications for thermal properties in a less familiar context. Part (a) asked candidates to explain the count of vibrational modes; most answered this correctly. Part (b) involved deriving the phonon density of states from a given dispersion relation; while most candidates attempted this successfully, arithmetic errors were common. Part (c) asked for the Debye frequency in terms of the density of states; again, most managed the derivation, but some confused electronic and vibrational structures. Part (d) required re-derivation of the internal energy of phonons, following lecture material; most completed this correctly. Part (e) asked for the asymptotic behaviour of the heat capacity at low and high temperatures. Many candidates made unnecessary or incorrect derivations—often differentiating prematurely or mishandling limits. Part (f) posed an open-ended qualitative question on how changes in interaction would affect the phonon dispersion. This was poorly answered overall.

Q5. This question explored canonical ensemble statistical mechanics, entropy, and partition functions. Part (a) asked for definitions and examples using a model system. A frequent mistake was confusion over the definition of a microstate. Part (b) was intended as straightforward, and most answered it correctly. Part (c) asked for a derivation of entropy. The most common errors included starting from the wrong expression and incorrectly defining variables. Part (d) asked for the maximum-entropy composition and its interpretation. Many omitted consideration of temperature, likely due to the apparent microcanonical framing of the question, though it was more relevant to the canonical ensemble. Part (e) asked for a step-by-step derivation of the temperature-dependent probability of occupying a particular energy level. The most common mistakes were incorrect counting of states and mishandling of degeneracy. Part (f) built on part (e), asking for the same derivation and an interpretation. The same types of errors reappeared, particularly omissions of degeneracy and incorrect state counting.

Q6: This question focused on interpreting SEM images and SEM-EDX data. The first subsection was relatively straightforward, with real images provided to illustrate the differences between secondary electron (SE) and backscattered electron (BSE) signals. While most students correctly described the differences and their respective characteristics, around half were unable to correctly identify the images. The second subsection presented an SEM-EDX line profile across a grain boundary, and students were asked to explain the signal spread. Most students correctly recognised the importance of the interaction volume, with some noting that its size was comparable to the spread of the signal—an encouraging observation. The final subsection addressed a topic not explicitly covered in lectures but inferable from the materials and case studies provided. It concerned the use of a focused ion beam (FIB) as a SIMS instrument when coupled with a suitable mass spectrometer. Only half of the cohort correctly identified that the Ga^+ ion beam could act as the primary ion source in SIMS. Overall, the average mark for this question was just over 50%, which is relatively low considering the level of coverage in the course.

Q7: This question addressed the quantitative characterisation of a multicomponent alloy. The first subsection asked students to identify three techniques capable of detecting lithium and to discuss the advantages and limitations of each. Most students correctly identified at least two techniques, and many named three. However, not all responses addressed all three points required in the technique discussion, suggesting a lack of attention to the question structure. The second subsection focused on quantitative EDX. In the first part, students were asked to identify X-ray peaks and comment on overlaps, which was done correctly by most. The next task required calculating the correct composition. While most students set up the equations properly, only about half arrived at the correct result. In the final part, students were asked to discuss the sources of experimental error. Despite this being a topic emphasised in the lectures, only a minority addressed it accurately. Most responses focused solely on statistical errors, neglecting more relevant sources such as matrix effects or detector limitations.

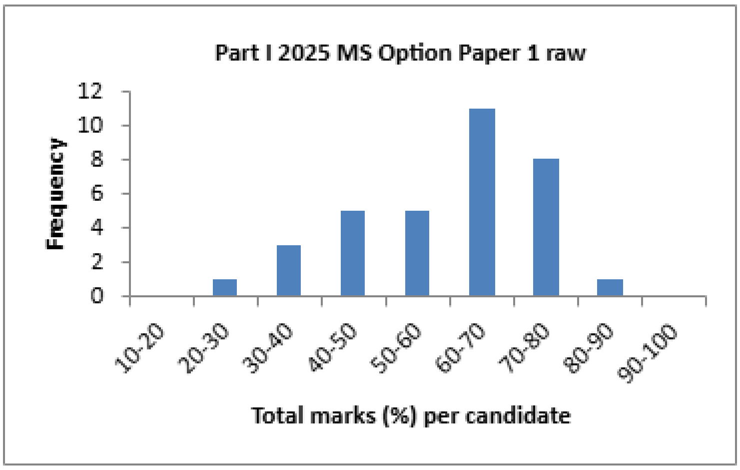
Q8. Several candidates gave confident explanations of how FIM images are formed and clearly described how defects appear in such images. However, some confused FIM with APT or incorrectly suggested APT could be used to image single vacancies in place of STM in part (c). Part (d) was generally well answered, with many candidates providing clear descriptions of the relevant features.

Materials Options Paper 1

Examiner: **Chris Patrick**
Candidates: 34
Mean mark: 59.5
Maximum mark: 81
Minimum mark: 25

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	28	16.52	21.25	6.75	Magnetic and Superconducting Materials
2	0	0.00	0	0	Magnetic and Superconducting Materials
3	28	13.72	21.75	3.75	Prediction of Materials Properties
4	14	13.95	19.5	6.5	Prediction of Materials Properties
5	7	14.07	22.25	6.25	Materials and Devices for Optics and Optoelectronics
6	4	16.81	20.75	8.5	Materials and Devices for Optics and Optoelectronics
7	12	14.04	22.25	4.5	Microstructural Control in Engineering Alloys
8	10	12.10	17.75	5	Microstructural Control in Engineering Alloys
9	18	16.44	22.25	8.75	Biomaterials
10	11	17.59	22.75	13	Biomaterials
11	1	5	5	5	Engineering Ceramics: Synthesis and Properties
12	2	16	20.75	11.25	Engineering Ceramics: Synthesis and Properties



General Comments

The OP1 course in the 24-25 academic year was different from 23-24, due to Biomaterials being moved from OP2 to OP1 and Engineering Ceramics being discontinued. The paper still contained Engineering Ceramics questions in section F for returning students who might have followed this course in 23-24. The questions provided by course lecturers were used mainly without modification, except for an instance where the question length was reduced. Although the mean mark was <60, this value was heavily influenced by a few scripts with low scores. The median mark of 65 better reflects the performance of the majority of candidates, and led to the decision not to apply any scaling. Unfortunately, no candidates chose to answer Q2 on magnetism, whilst Q1 on superconductivity (the same option) was one of the most popular. This is discussed in more detail below, but might indicate some students employing a pre-emptive strategy of neglecting to revise the magnetism part of the course. Whilst it is the students' prerogative to do this, it cannot be considered an ideal situation, and ought to be addressed.

1. A popular question on superconductivity which covered both general theory and practical aspects of processing YBCO. The question was generally answered well. Some answers seemed unwilling to make use of 1st year EM knowledge of Ampere's law. There were some excellent answers to (c)(ii).
2. No students opted to answer this question on magnetism. It contained a reasonably large proportion of bookwork covered in the lectures (including a figure taken directly from the slides), and part d was answerable based on GP2 knowledge. This might indicate students having already decided before the exam not to attempt the question.
3. This popular question addressed the treatment of many-electron atoms at the mean-field level, a topic which has appeared in several past exam questions. Students could identify terms in the Hamiltonian and most remembered how to construct the density. The mathematics of (f) was not straightforward, and most answers failed to get the correct limit when r->0.
4. This was the less popular prediction question on electronic excitations and the Kramers-Kronig relation. Despite its unfamiliar presentation, a large part of the question was answerable using Y1 quantum mechanics and maths. Only part (f) really required specific DFT knowledge, and there were a few excellent answers.
5. This was the more popular optoelectronics question, which had the same form as a past question (2011-12). It mainly relied on bookwork knowledge and insertion of numbers into the correct equations. As such, one might have hoped for a higher average mark, but there were some excellent answers, including for part (d)(iv).
6. The less popular optoelectronics question (it should be noted that the uptake of this course was low in 24-25, and this is reflected in the number of question attempts for 5 and 6). The question was mainly bookwork. Marks tended to be lost on part (a)(ii), deriving the condition for guided modes. The more descriptive part in part (d) was answered well in general.
7. A question on alpha/beta alloys. Answers were broadly good with some excellent parts, but marks were lost sometimes by not addressing the specific points raised by the question and being too general. There also was some uncertainty in identifying e.g. suitable elements to promote different phases.

8. A question on production of Al and Mg alloys. The answers showed a good general level of knowledge but it proved difficult for students to get maximum marks on any part of the question. As with question 7, there was a tendency for answers to have acceptable general detail but not to go into sufficient specifics as required by the question.

9. A popular biomaterials question on bones and tissue engineering which was answered well. The lowest-scoring part was the description of osteoarthritis, with answers sometimes not progressing beyond a superficial level of detail. The bookwork derivation in a(iii) was done quite well although there was some confusion over the appropriate loading. Part c(ii) showed a good awareness of the limitations of various materials.

10. A less popular biomaterials question on the use of biomaterials in treatments and surgery. This question attracted the highest marks and was well answered overall. It was mainly recalling bookwork, with some defect chemistry at the end which was quite well answered.

11. A ceramics question which was answered by a single returning candidate. The topic of failure and fracture appears also in GP3.

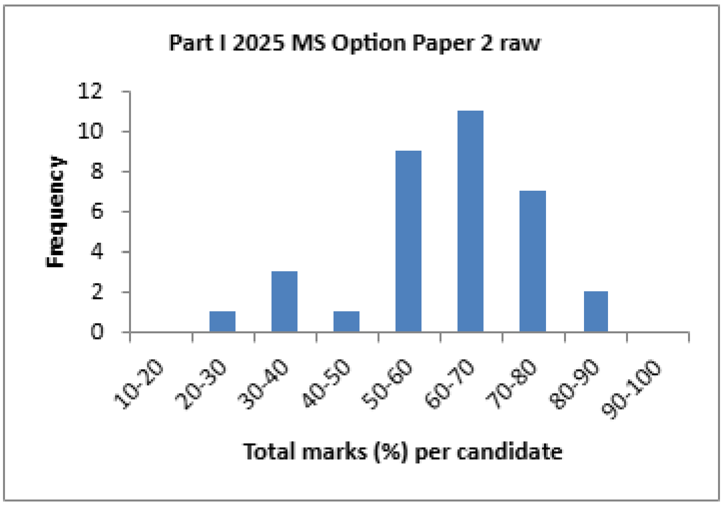
12. A ceramics question which was answered by two returning candidates. One candidate did well to obtain full marks on part c(ii), which was not straightforward.

Materials Options Paper 2

Examiner: **Nicole Grobert**
Candidates: 33
Mean mark: 60.8
Maximum mark: 84
Minimum mark: 27

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	3	14.92	17	13.75	Materials for Nuclear Systems
2	20	16.96	21	12	Materials for Nuclear Systems
3	17	13.53	21.5	6	Enabling Nanotechnology
4	12	14.96	19	9.5	Enabling Nanotechnology
5	22	16.27	23	6	Advanced Polymers
6	20	16.00	22	3	Advanced Polymers
7	7	15.21	21.5	7	Quantum Technology
8	1	15.00	15	15	Quantum Technology
9	15	12.48	20	6	Energy Materials
10	14	16.16	22	8	Energy Materials
11	0	n/a	n/a	n/a	Biomaterials (For Returning Candidates)
12	0	n/a	n/a	n/a	Biomaterials (For Returning Candidates)



General Comments

1. **Question 1:** covered MATERIALS FOR NUCLEAR SYSTEMS and tested the understanding of key materials used in nuclear reactors, *e.g.*, graphite and zirconium alloys, and how these materials behave under operational conditions such as irradiation, oxidation, and corrosion. It evaluated both conceptual knowledge (*e.g*. functions and mechanisms) and applied understanding (*e.g.* effects on material properties and interpretation of data through sketching and analysis). The question was taken by only three students therefore no trends could be indentified.
2. **Question 2** focused on MATERIALS FOR NUCLEAR SYSTEMS, specifically atomic displacement and radiation damage. It assessed the understanding of concepts such as self-interstitial atoms and threshold displacement energy, and their ability to apply models like Kinchin-Pease. The question also required interpretation of directional effects in crystal lattices and estimation of displacement rates, alongside critical evaluation of experimental setups for neutron irradiation. Part a involved basic definitions and was generally well answered. Part b, which asked about packing differences in crystallographic directions, revealed varied understanding and some confusion. Part c was straightforward bookwork and performed well by most. Part d required a calculation similar to a tutorial exercise, but students struggled to extract the correct cross-section from a graph and convert units from Barns to per cubic metre, partly due to uncertainty about the energy range of fast neutrons (2–10 MeV). Part e asked for a discussion on dose rates and the limitations of accelerated testing, but responses were generally weak and lacked depth. 20 students attempted Q2 with an average mark of 16.96.
3. **Question 3:** concerns ENABLING NANOTECHNOLOGY. It focuses on the understanding of the working principles of liquid crystal displays, nanomanufacturing, and transistors and tests both conceptual knowledge as well as the ability to apply principles to practical scenarios. Students were expected to explain physical mechanisms, interpret material properties, and perform basic calculations. The question also encourages critical thinking about real-world challenges in scaling and material selection for advanced technologies. The students generally demonstrated a solid grasp of theoretical concepts and definitions, but struggled when asked to apply these ideas to practical problems or analyze real devices. This was especially evident in multi-part questions, where partial credit was often awarded for isolated correct concepts, but few students managed to integrate their knowledge into complete solutions. The performance suggests that while foundational understanding is strong, bridging the gap between theory and practice remains a challenge. This is a common issue in technical subjects and could be addressed by incorporating more worked examples into lectures. 17 students attempted Q3. The average score for this question was 13.53 marks.
4. **Question 4:** covered ENABLING NANOTECHNOLOGY with focus on memory devices and nanomanufacturing. In part (a), students were asked to explain the working principles and properties of SRAM, DRAM, and Flash memory, compared ReRAM and PCM storage mechanisms, and to identify the key difference between conventional and in-memory computing DNN accelerators. Part (b) focused on nanomanufacturing, asking students to distinguish between bottom-up and top-down approaches with examples, and to describe nanoimprint lithography along with its advantages. There was no clear trend in topic-specific understanding, but students again showed greater comfort with definitions than with practical application. Individual marks across both questions ranged from 28% to 88%, with most clustering around the middle. The results indicate reasonable consistency across the cohort, though nanotechnology appears to differentiate students more distinctly based on their ability to handle complex, interconnected concepts. Moving forward, integrating more case studies and real-world examples throughout the term could help students develop stronger problem-solving skills. 12 students chose Question 4 and performed slightly better with an average score of 14.96.
5. **Question 5**: focused on ADVANCED POLYMERS and assessed the students on thermodynamics, thermal analysis, and structural characterisation methods. Sub-question (a) focused on enthalpy and entropy of mixing, as well as nucleation and growth processes, and was well answered with an average score of 69%. In (b), students explained DETA measurements and the influence of frequency and molecular weight on glass transition temperature; performance dipped slightly (65%) due to difficulties interpreting T_g data. Sub-question (c) required comparison of neutron and X-ray scattering techniques and interpretation of SANS and SAXS data, which was handled competently (average 69%). The students generally performed well on Question 5, demonstrating a solid grasp of core principles and the ability to apply their knowledge effectively. While most candidates handled descriptive and

conceptual elements confidently, performance varied slightly depending on the complexity of interpretation and reasoning required. Overall, the 22 students who attempted Q5 averaged 68.2%.

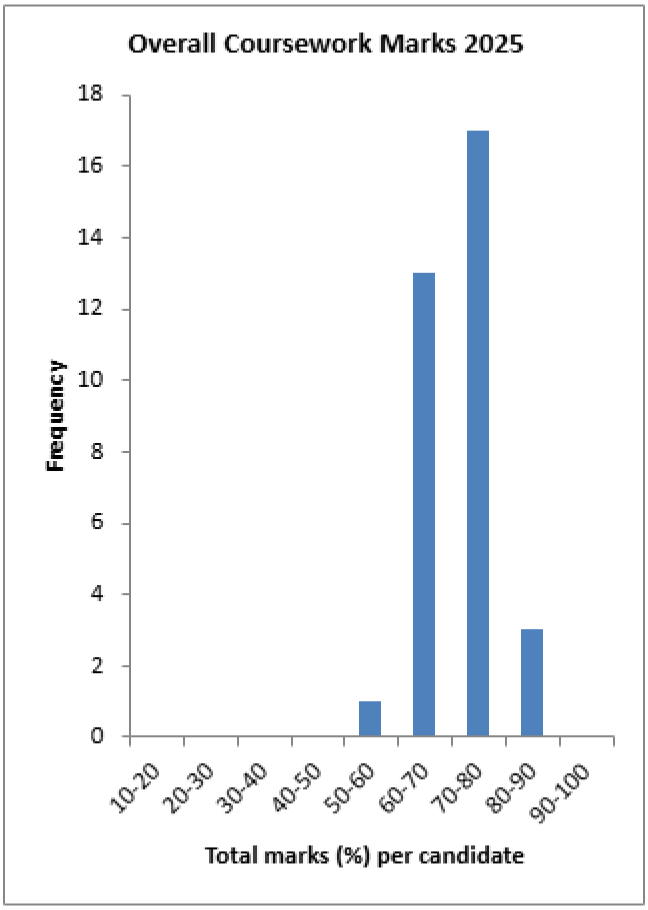
6. **Question 6** on ADVANCED POLYMERS focused on phase separation, interfacial phenomena, block copolymers, and SANS-based problem solving. In (a), students explained spinodal decomposition and linked polymer morphology to processing conditions, performing strongly with an average of 72%. Sub-question (b) was more conceptually demanding, covering block copolymer behaviour at interfaces and interfacial fracture energy; students struggled to integrate these ideas, resulting in a lower average of 51%. In (c), students tackled a quantitative problem involving SANS characterisation; while conceptual understanding was evident, calculation errors were common, yielding an average of 66%. Question 6 revealed a mixed level of performance, with students showing strong understanding of foundational and descriptive content but encountering more difficulty with conceptually demanding and quantitative aspects. The results suggest that while students are well-prepared in theory, further support is needed to strengthen their analytical and problem-solving skills. Among the 20 students who attempted Q6, the average mark was 61.2%.
7. **Question 7:** on QUANTUM TECHNOLOGY explored the principles and applications of Quantum Key Distribution (QKD), as illustrated in Figure 7.1, where two parties—Alice and Bob—generate a shared random key by exchanging single photons encoded with polarisation states. Part (a) asked students to explain how this method ensures that a third party cannot intercept the key. Part (b) then addressed how the secure key enables perfectly secure communication and how the length of the key must match the size of the message to maintain security. Question 7 was answered well by a couple of students who clearly understood the concepts and were able to work through the numerical example in part d. The weaker answers showed more superficial understanding in the early parts of the question and struggled to construct a sensible estimate for the part d question. Seven students attempted this question. The average mark was 15.21.
8. **Question 8** on QUANTUM TECHNOLOGYT introduced the concept of quantum computing and explores why quantum computers can outperform classical ones for specific types of calculations, particularly due to their ability to exploit quantum superposition and entanglement. Question 8 was taken by only one student therefore who achieved 15 marks.
9. **Question 9** covers ENERGY MATERIALS and focuses on Li–air batteries and was designed to assess students' understanding of fundamental electrochemical concepts discussed during the lectures and reinforced in related courses. Parts (a)–(d) addressed the core electrochemistry of the system, and were generally well answered. However, part (e)-(f), which required interpretation of phase behaviour and construction of voltage profiles, revealed some confusion about the number of phases involved; only a small number of students provided accurate sketches. Part (gi), concerning the advantages of solid-state electrolytes, was handled competently by most students. In contrast, part (gii), which explored the distinction between total ionic motion (radiotracer) and charge-carrying ions (EIS), was less well understood. Few students referred to the Haven ratio or noted the implication that, on average, three ion hops are required to transport a single charge. Nine students attempted this question and the average score was 12.48.
10. **Question 10:** addresses ENERGY MATERIALS. It focuses on solar cell physics and materials, including both ideal and real-world performance. It tests the ability of the students to interpret spectral absorption, calculate open-circuit voltage from quasi-Fermi levels, and explain deviations due to practical limitations. It also assesses knowledge of perovskite halide structures, defect chemistry, and the impact of ionic doping on ion migration. 14 candidates attempted this question on solar cells based on silicon and perovskite halides. Most candidates did this question fairly well, covering band structures, voltage behaviour. perovskite structures and atomic defects. The final part on defect reaction equations was the most challenging and least well answered. The average mark was 16.16
11. **Question 11:** Was not taken.
12. **Question 12:** Was not taken.

COURSEWORK

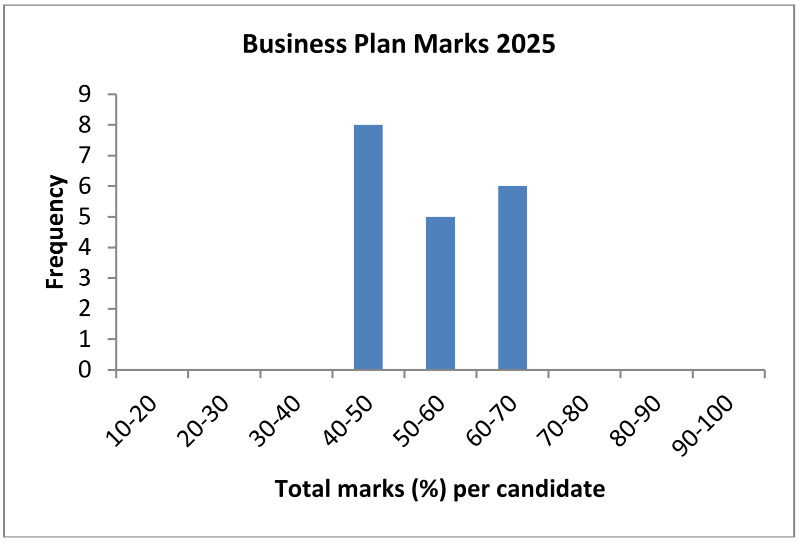
A maximum of 200 marks are available for Part I coursework which comprises:

- 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 52.67%) were lower than in previous years



Report on Business Plan 2024

The candidates for this module were arranged into 4 separate teams, with each team submitting a single business plan. The business plans were assessed by two examiners 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 7 different sections of the business plan which are weighted according to their importance for the plan.

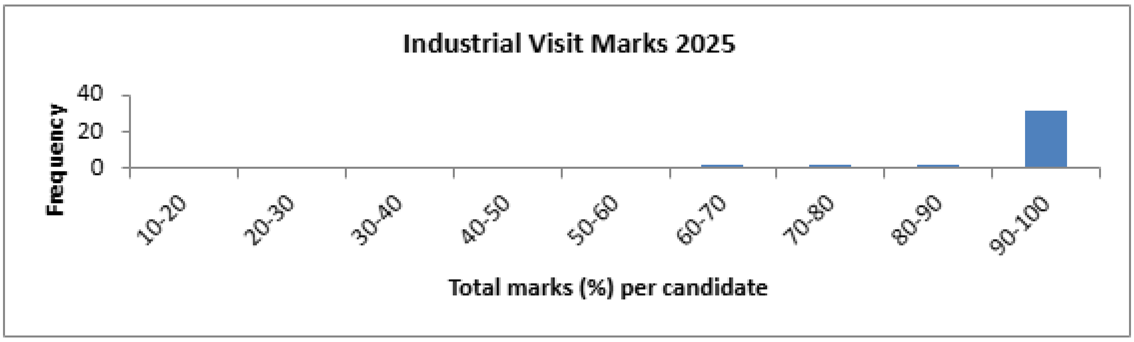
In 23/24 the most highly marked plan was more consistent across all sections and across the two markers. Overall the product sections were average with teams outlining or articulating the benefits of their products clearly, but not in reasonable depth. The plans with lower marks show some significantly weaker sections, and it was disappointing to see two teams scoring well below 50. This was compounded when those sections on commercialisation issues and risk assessment sections, as well as finance issues were weakest, which combined make up 40% of the marks.

Most teams this year could have developed their commercialisation issues more strongly. Working as a team they should be able to help one another identify issues and collectively be able to develop responses to them. The notion of exiting after just 1 or 3 years as a commercialization strategy seems very short-sighted and gives a strong sense of a lack of entrepreneurial vision.

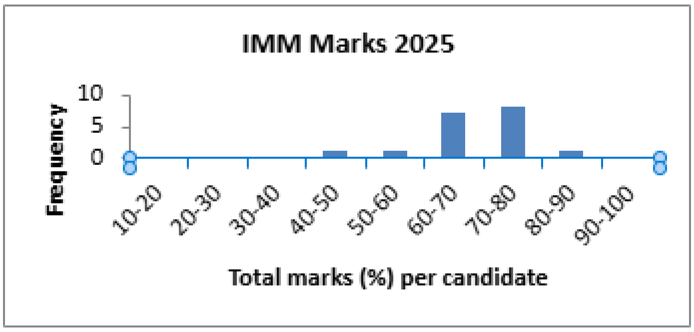
What is also unique this year is that the plans were significantly weaker as a whole from previous years, particularly the commercialization strategy and the financial aspects. Some thinking into the planning process for setting up a company and running it should precede putting the proverbial pen to paper, and it appears from our assessments that this was not done properly, with significant critical thought.

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).

The **Industrial Visits** mark (average 94.38%) 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 69.59%) ranged throughout the lower 2nd to 1st class boundaries.



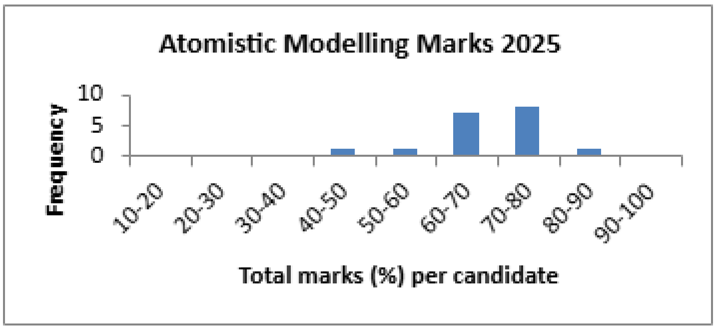
Report on the Introduction to Modelling for Materials Science module

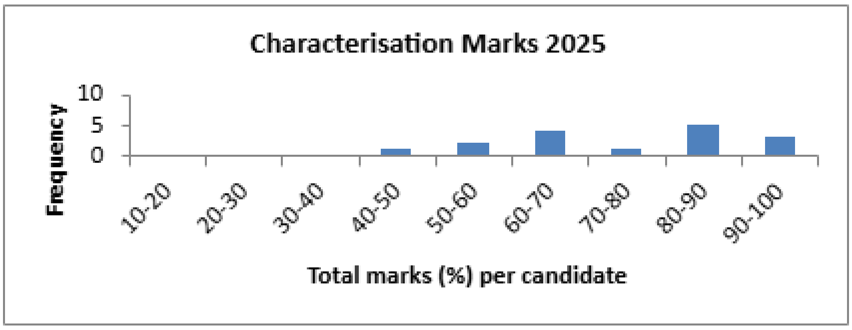
The four classes were held in person this year, with the teaching split across two class rooms. The classes ran smoothly - it my impression that the number of students with prior computing experience continues to increase, and this helps the whole cohort. Support for the projects was provided through 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 68.28%) and **Advanced Characterisation** (average 73%), 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 years, being run in-person in the teaching room in the MML. 21 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.

This year saw the introduction of a new multi-core Linux server, Ramsey, which represented a significant hardware upgrade compared to previous years. All students were given user accounts on this machine,
and were instructed how to install and use freely available software (e.g. MobaXterm) to access the server 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 server and the students instructed how to run software serially and in parallel. There were no significant technical issues.

The written reports were completed to a similarly high standard to previous years. It was pleasing to see some students attempt more ambitious calculations, which have been made possible by the increased computing power available. It was quite clear from reading the reports which students had sought help with resolving technical difficulties compared to others who had not; it is worth re-emphasising that all students are encouraged to ask for help when needed. Some reports lost marks for not including appropriate scientific references, particularly in the Introduction and Discussion sections. As in previous years, the highest-scoring reports did not necessarily contain the largest amount of data. Rather, they showed data presented in a logical and consistent way, with careful analysis which drew on what the students have learnt both in this module and in the wider Materials Science course.

Dr C.E. Patrick

Report on the Characterisation of Materials Option Module

This module offers students a practical, hands-on opportunity to deepen their theoretical knowledge of materials characterisation techniques. It focuses on developing laboratory skills across a variety of instruments, including optical microscopy, scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD), micro-indentation, and optical emission spectroscopy. Additionally, the course aims to foster independent research skills in preparation for the Part II year in the following academic year.

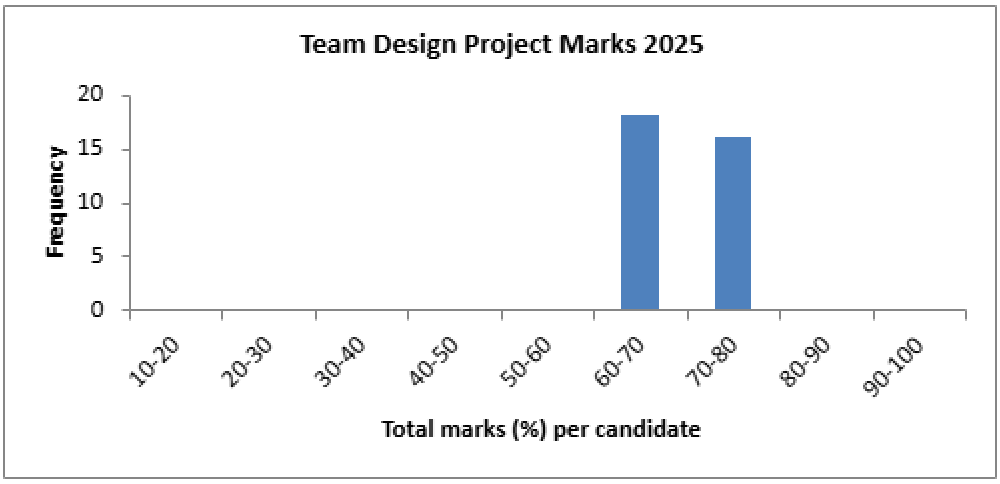
The module organisers extend their sincere gratitude to Teaching Laboratory Manager, Daniel DeBrincat, for his valuable support during the course and its organisation, and accommodating the increased number of students in the lab. Special thanks are also due to Anthony Akinwale, and Kieran Rivers for their vital role in course planning and leadership of the day-to-day management of the module. The organisers further acknowledge the invaluable support of the Junior Demonstrators, whose dedication greatly enhanced the student experience. Their commitment to training, troubleshooting, and providing access to the microscopes was instrumental, and their willingness to go above and beyond was deeply appreciated.

This year, the assessors were particularly impressed by the overall quality of the student reports. Many submissions were a pleasure to read, reflecting careful attention to guidance and thoughtful interpretation of data albeit several students not labelling any peaks in their spectra. The marks awarded ranged from 14 to 29 out of 30, with an average score of 70%—a slight drop from the previous year.

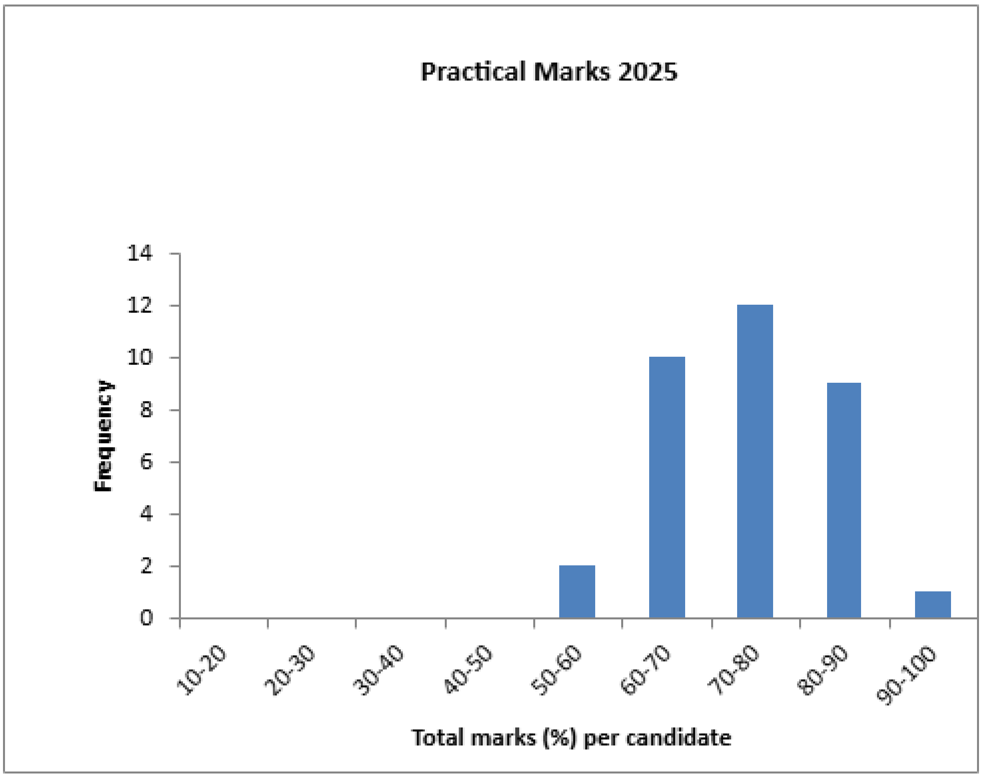
Nicole Grobert 25-06-2025

Report on Team Design Project

The students were allocated to one of six Teams by the TDP Organiser. Each team consisted of six students. The TDP Organiser aimed to make the teams as diverse as possible, based on student's College, gender, English not the first language, SpLDs and students who had opted out of the Entrepreneurship module (as this included formative assessment of a presentation). All students contributed to the writing of their team's report and all students took an active role in the presentations to the Examiners. Marks for the combined report and presentation were out of 50. The maximum difference between the initial marks of the two Examiners was 1.5 marks. Agreed marks for the teams ranged from 31 to 38 out of 50. No adjustments were deemed necessary for individual student performance. Both Examiners thoroughly enjoyed reading the projects and attending the presentations.



The marks for **Practical Classes** (average 94.4%) 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

2nd year Practical Class Marks 2023-24

I have reviewed the marks from the 2nd year practical's conducted in academic year 2023-24. All students completed all practicals.

There is a range of overall average marks, assuming the standard penalties are applied, from 55 to 73% (the previous year they ranged from 58 to 81% before penalties), with a mean of 73.5 % and median of 73.3% (compared to 70% and 70.2% last year before penalties). The mean lab notebook mark was 1.8/3, close to our objective of 2, but lower than last year (2.1/3), while the mean on the reports was 8.6/13, lower than last year's average of 9.1/13.

Late penalties

In line with previous years, when candidates missed the deadline by less than 15 minutes, no penalties are given. We are proposing late penalties to the following reports:

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**:**

[redacted]

Missed practicals:

[redacted]

Plagiarism: No plagiarism was reported

DEJA 26/6/25

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 (%)				
	24/25	23/24	22/23	21/22	20/21	24/25	23/24	22/23	21/22	20/21
I	11	13	13	15	19	26	29.5	32.5	36.6	65.5
II.I	25	22	23	22*	12	59.5	50	57.5	53.7	31.0
II.II	6	9	4	4	2	14	20.4	10	9.8	3.4
III			-	-	-		-	-	0	0
Pass			-	-	-		-	-	0	0
Fail	-	0	-	-	-	-	-	-	0	0
Total	42	44	40	41*	33	-	-	-	-	-

* 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

All vivas were carried out with Examiners, Assessors and Candidates present in person. One candidate was given permission by the Education Committee to not attend the viva. 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 42 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 36% to 90% 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.

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

The mean mark for theses written by female Part II candidates was 70.56% while the mean mark for theses written by male candidates was 67.42%.
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	5	3	3	0	4	9
60–70	12	11	12	8	11	5
70–80	7	2	6	7	9	1
80–90	2	0	3	1	2	1
90-100	0	0	1	0	0	0
Totals	26	16	26	16	26	16

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.

[redacted]

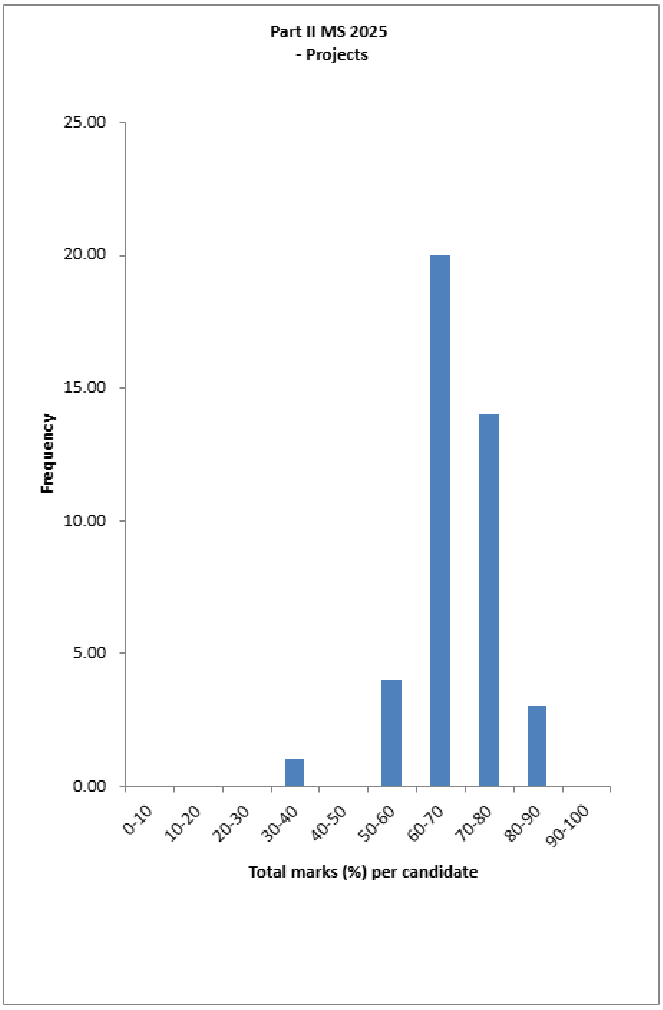
F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. R. S. Bonilla	Prof. P. Midgley (External)
Prof. M. Galano	Prof. K. O'Reilly
Prof. C. Grovenor	Prof. C. Patrick
Prof. R. Goodall (External)	Prof. M. Pasta
Prof. N. Grobert	

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

Report on Part II Projects

Candidates:	**42**
Mean mark:	**68%**
Maximum mark:	**90%**
Minimum mark:	**36%**



Examination Conventions 2024/25
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 2024-25. 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 Committee* 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 scrutinised 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.

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 candidate's. 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 <u>set</u> 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 2024/25 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 2024/25 session is 7days. 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 2024/25 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 2024/25 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 24/25 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):

(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 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:

  (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?wssl=1).

  (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?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 candidate's.

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 circumstances 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 circumstances 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/DDM† 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 2025 are: Professor Sebastian Bonilla, Professor Marina G alano, Professor Nicole Grobert, Professor Chris Grovenor, Professor Keyna O'Reilly (Chair), Profess or Mauro Pasta, Dr Chris Patrick. The external examiners are Professor Paul Midgley, University of C ambridge, and Professor Russell Goodall, University of Sheffield.

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 2025 (For Part I and Part II students who embarked on the FHS respectively in 2023/24 and 2022/23)

	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
Part I Total		*800*
Part II	Thesis	400
Overall Total		*1200*

† 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 2025

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**

University of Oxford External Examiner Report - 2024/25

Response ID: cmd5s0kk201hljt08rwe2xs63
Submitted: 16 Jul 2025 10:46 AM
Duration: 00:06:14

EXTERNAL EXAMINER REPORT for the academic year 2024/25

1. Please check your title is correct, and select another option if needed

Professor

2. If you entered other, please specify

No response

3. Please check your first name(s) is correct, and amend if needed

Paul

4. Please check your last name is correct, and amend if needed

Midgley

5. Please enter the name of your home institution

University of Cambridge

6. Please check the course level of the course(s) you acted as external examiner for is correct, and select another option if needed

Undergraduate

7. Please check the Division(s) responsible for that the course(s) that you acted as external examiner for comes under are correct, and amend if needed

Mathematical, Physical and Life Sciences Division

8. Please check the Faculty/Department(s) responsible for that the course(s) that you acted as external examiner for comes under are correct, and amend if needed

Department of Materials

9. Please check the course(s) that you acted as external examiner for are correct, and amend if needed

DMTA: Honour School of Materials Science (Part I); DMTB: Honour School of Materials Science (Part II)

10. Please select whether you have just completed your first year of your term of office as external examiner, whether you have now completed your entire term of office, or whether you are in another year of your term of office

Other year of term of office

11. Please check the date the final Examination Board took place is correct, and amend if needed. If you acted at external examiner for multiple courses which had separate Examination Board meetings, please check the correct date for the latest Examination Board meeting is showing, and amend if needed.

04 July 2025

Part A

12. Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?
(Please refer to paragraph 15 of the Guidelines for External Examiner Reports)

12.1 A1. i) Academic standards of students

Yes

12.2 A1. ii) Academic achievements of students

Yes

13. Do the threshold standards for the programme appropriately reflect:
(Please refer to paragraph 16 of the Guidelines for External Examiner Reports)

13.1 A2. i) The frameworks for higher education qualifications?

Yes

13.2 A2. ii) Any applicable subject benchmark statement?

Yes

14. In relation to the academic process:

14.1 A3. Does it measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?

Yes

14.2 A4. Is it conducted in line with the University's policies and regulations?

Yes

15. In relation to the information and evidence provided to you:

15.1 A5. Did you receive it in a timely manner to be able to carry out the role of External Examiner effectively?

Yes

16. Regarding your previous report, please indicate whether you:

16.1 A6. Received a written response to your previous report?

Yes

16.2 A7. Are satisfied that comments in your previous report have been properly considered, and where applicable, acted upon?

Yes

Part B

17. B1. 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?

This is my third year as External Examiner and I can confirm once again 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.

18. B1. 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; in my case I tended to ask questions towards the end of the viva. As in previous years, 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, some using notes, others not.

At the end of the viva the final scores were agreed between the two internal Examiners with further agreement from the External. As in previous years, 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. The performance of the students I saw this year was overall very good and my sense was that this year's cohort was the best I've seen in my three years as External Examiner, and the scores reflected that. Some of the projects' results were undoubtedly at a level that could be written up for a journal publication.

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 materials students, they were challenging and probing of the student's analytical and problem-solving skills. The Externals had Friday morning to scrutinise some exemplar scripts and coursework etc and 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 scripts with marks corresponding to 2nd class and 3rd class scores. I was comfortable that those candidates in each class had been given the correct mark. The final scaled mark distribution, which we saw in the Part I Pass Meeting on Friday afternoon, looked very reasonable. As in previous years I can say that the achievements of the cohort are very good and the students compare very favourably with others at my own and similar universities in the UK.

19. B2. 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 in previous years, 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 in previous years, 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 Reports, I would encourage the Department to continue with this double marking 'gold standard' approach if at all possible.

In the Part I Pass Meeting the marks were reviewed and it was agreed that no scaling needed to be applied to the marks this year. Candidates with failures in one or more papers were discussed with agreement reached on whether they could progress to Part II.

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 reply to the Externals submitted shortly afterwards. Most of the model/exemplar answers were helpful and well annotated.

20. B3. Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University? If you acted as external examiner for multiple courses, please indicate whether the issues related to all or selected courses.

None this year.

21. B4. 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 possibility to make the viva a more formal part of the Part II assessment was raised again this year with the Examiners. I went into some detail in my Report last year about the possible benefits of this so I won't reiterate my view here. My understanding is that this is a 'live' topic and is under some discussion within the Department.

22. B5. a) 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.

I would like to thank the Department for hosting the Externals so well. From my perspective the week ran very smoothly indeed. I'd like to thank in particular Keyna O'Reilly, the Chair of Examiners, Tom Heath, Anna Lloyd and Rebecca Bradford for their great help with many of the week's logistics.

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

23. B5. b) Now that your term of office is concluded, please provide an overview here.

No response

Thank you for completing your 2024/25 external examiner report for the University of Oxford

University of Oxford External Examiner Report - 2024/25

Response ID: cmd7kk96k01lfl7085pzqp4h3
Submitted: 17 Jul 2025 4:53 PM
Duration: 315:39:50

EXTERNAL EXAMINER REPORT for the academic year 2024/25

1. Please check your title is correct, and select another option if needed

Professor

2. If you entered other, please specify

No response

3. Please check your first name(s) is correct, and amend if needed

Russell

4. Please check your last name is correct, and amend if needed

Goodall

5. Please enter the name of your home institution

University of Sheffield

6. Please check the course level of the course(s) you acted as external examiner for is correct, and select another option if needed

Undergraduate

7. Please check the Division(s) responsible for that the course(s) that you acted as external examiner for comes under are correct, and amend if needed

Mathematical, Physical and Life Sciences Division

8. Please check the Faculty/Department(s) responsible for that the course(s) that you acted as external examiner for comes under are correct, and amend if needed

Department of Materials

9. Please check the course(s) that you acted as external examiner for are correct, and amend if needed

DMTA: Honour School of Materials Science (Part I); DMTB: Honour School of Materials Science (Part II)

10. Please select whether you have just completed your first year of your term of office as external examiner, whether you have now completed your entire term of office, or whether you are in another year of your term of office

First year of term of office

11. Please check the date the final Examination Board took place is correct, and amend if needed. If you acted at external examiner for multiple courses which had separate Examination Board meetings, please check the correct date for the latest Examination Board meeting is showing, and amend if needed.

04 July 2025

Part A

12. Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?
(Please refer to paragraph 15 of the Guidelines for External Examiner Reports)

12.1 A1. i) Academic standards of students

Yes

12.2 A1. ii) Academic achievements of students

Yes

13. Do the threshold standards for the programme appropriately reflect:
(Please refer to paragraph 16 of the Guidelines for External Examiner Reports)

13.1 A2. i) The frameworks for higher education qualifications?

Yes

13.2 A2. ii) Any applicable subject benchmark statement?

Yes

14. In relation to the academic process:

14.1 A3. Does it measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?

Yes

14.2 A4. Is it conducted in line with the University's policies and regulations?

Yes

15. In relation to the information and evidence provided to you:

15.1 A5. Did you receive it in a timely manner to be able to carry out the role of External Examiner effectively?

Yes

16. Regarding your previous report, please indicate whether you:

No response

Part B

17. B1. 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?

I served as External Examiner for the first time this year. I have found that the examinations and assessments that are set are challenging, and that students have performed well in these. In the graduating cohort, a number of 1st class degrees were awarded, with the majority of students receiving a 2:1 classification, and a small number of 2:2 awards. Overall, the standards attained by students within each classification compare well against those that achieve the same classification in my own institution, and in others that I have knowledge of. Within those reaching the top classification, there were some individuals of clearly exceptional ability, who would stand out on any programme or in any institution.

18. B1. 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).

During the examination cycle, I was able to review the Part I papers set, and the model answers, before these were finalised examinations, and I was also able to observe and participate in the viva examinations for the Part II students, and observe a selection of work from the completed Part I assessments, as well as participating in the final exam board.

In the Part I examinations, students had to respond to questions which demanded good understanding of the taught content, beyond simple recall. On the whole, in most papers there was a higher occurrence of calculation-based questions than is typical for a Materials programme, and the assessments used would present a high degree of challenge to students from any university studying an equivalent degree.

Among the results, it was notable that there was a high failure rate in General Paper 4, although no issues were detected with the paper itself. This may be a result of natural variation in student performance and a relatively small cohort size, but should be monitored in case this indicates a wider issue.

I was present for 21 different viva examinations for Part II students, defending their dissertations on their projects. I felt the students as a cohort were well prepared and very confident in presenting their research and defending their work, to at least as good a standard as final year students on other similar programmes in other institutions. Their subject knowledge was generally good, with some impressive candidates who had a deep understanding of their field.

I believe the students on the programme are being educated to a high standard, and are performing at a level that compares well to other institutions.

19. B2. Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University's regulations and guidance.

The Part I examination papers shared with me in the preparation stage were written to a high standard, and I only raised a small number of relatively minor comments. In particular I was impressed by the approach taken in a significant fraction of the model answers, which contained clear commentary of how the questions related to content that the students had been taught, and how they would have to infer some of the answers from their knowledge.

During my visit, a number of marked scripts were presented for my examination; three submissions for each of the papers, one of which had attained higher marks, another near the middle of the range and one with lower marks. With some effort it was possible to correlate papers with the awarded marks, and assessment of the scripts with the model answers found that the overall mark arrived at was commensurate with how I would have assessed the paper.

At the final exam board, candidates were considered carefully, with clear and consistent reference to the University regulations. It was notable that no scaling of marks for any of the papers was applied this year, as based on the performance of the cohort this was neither needed or justified. The absence of a need to make such adjustments indicates that the assessments were well pitched for the students, and avoids the distorting (and arguably unfair) effect of scaling processes.

I believe the assessment processes used are robust and fair.

20. B3. Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University? If you acted as external examiner for multiple courses, please indicate whether the issues related to all or selected courses.

There are no issues which are apparent to me that I believe need to be highlighted at higher levels. As is typical in assessment processes, a number of specific issues presented themselves for the examiners to address; these were handled sensitively, and prioritising the interests of each individual student while upholding the standards and procedures of the University.

I would make some comments on two aspects which can be considered within the Department and by the examiners.

1) Currently the Part II viva is not marked, but is rather used as an opportunity for moderation of the marks awarded by the two assessors. As such, from the degree outcome perspective there is not much to motivate or reward student attainment in this interaction. Nevertheless, presenting and defending one's work in person is a skill of value in the discipline (and in many of the career paths that graduates may follow), and is different to the capabilities that can be assessed in the written dissertation. As students and staff already participate in the vivas, there is only slight additional workload through allocating marks, and the moderation of assessors marks of the report could still take place. I would recommend that the Department considers allocating marks to the Part II viva examination in future years.

2) I am aware that the question of the distribution of examinations of the students (with the written exams that contribute to the degree classification all being in the same examination period) has been discussed previously, along with the hypothesis that the concentration at the end of the third year in the present system may raise the pressure on students at this point, and contribute to the relatively high proportion of students who take an interruption to their studies (which in turn may correlate with increased chances of a negative outcome). I do not propose to make a recommendation with regard to this, but rather to suggest that the Department could easily use the External Examiners as a means to get feedback from students on such issues. As the final year students are required to be present for the Part II vivas at the same time as the External Examiners, it would be possible for the Externals to meet with a group of students during one of the gaps to gain some independent and anonymous feedback for the Department on any such issues that they wanted to explore. I would be willing to trial this process in future years if the Department would find such feedback valuable.

21. B4. 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 Department operates a double-blind marking system for its written examinations. Such an approach, where two assessors independently arrive at marks, which are then discussed in cases of divergence, is highly robust against marking errors, and also suitable to use where different approaches to answering questions (which may not have been captured in the model answers) are valid. It is demanding on staff time compared to the more widespread system where there is a main marker and then a second moderator, who sees and verifies the marks awarded, but where this is tractable, it is worth maintaining.

22. B5. a) 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.

I would like to take the opportunity to thank the examiners and the support team for their assistance with providing access to the required information for me to carry out my assessment, and for the support and hospitality for my visit to Oxford. It was a pleasure to interact with all of the staff, and the open and helpful approach taken was most welcome.

I would also particularly like to highlight the sense I obtained of the collaborative spirit in which the Examiners, and the support staff, undertook their duties. The process was a significantly time consuming one for these staff, but I feel that they shared a goal of delivering the examination process to a high standard, and I look forward to participating again next year.

23. B5. b) Now that your term of office is concluded, please provide an overview here.

No response

Thank you for completing your 2024/25 external examiner report for the University of Oxford