Part II CATAM

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- CATAM manual: http://www.maths.cam.ac.uk/undergrad/catam/II
- Find these slides (PDF with links) at the CATAM webpage http://www.maths.cam.ac.uk/undergrad/catam
- Helpline: catam@maths.cam.ac.uk

2023/2024 projects - Part II

1. Numerical Methods

1.1 Fourier Transforms of Bessel Functions (6)
1.6 Multigrid Methods (10)

2. Waves

2.2 Dispersion (7)
2.11 Fisher's Equation for Population Dispersal Problems (9)

3. Fluid and Solid Mechanics

3.6 Particle Drift in a Periodic Flow Field (4)
3.9 Viscous Flow in a Collapsible Channel (9)
3.10 Smoke rings (8)

4. Dynamics

4.5 Euler's Equations (8)

5. Quantum Mechanics

5.2 S-Wave Scattering (7)
5.3 Bound State Energies for One-Dimensional Potentials (9)

7. Mathematical Methods

7.3 Minimisation Methods (8)
7.4 Airy Functions and Stokes' Phenomenon (9)

9. Operational Research

9.1 Policy Improvement for a Markov Decision Process (4)
9.4 Option Pricing in Mathematical Finance (6)

10. Statistics

10.9 Markov Chain Monte Carlo (6)
10.16 The Tennis Modelling Challenge (8)

11. Statistical Physics

11.3 Classical Gases with a Demon Algorithm (8)

12. Nonlinear Dynamics & Dynamical Systems

12.3 The Lorenz Equations (10)
12.6 Chaos and Shadowing (10)

13. Logic and Computation

13.1 Minimisation of Deterministic Finite-State Automata (10)

14. General Relativity

14.5 Cosmological Distances (8)
14.6 Isolating Integrals for Geodesic Motion (8)

15. Number Theory

15.1 Primality Tests (9)
15.10 The Continued Fraction Method for Factorisation (8)

16. Algebra

16.1 The Galois Group of a Polynomial (7)
16.5 Permutation Groups (7)

17. Combinatorics

17.1 Graph Colouring (7)
17.3 Hamiltonian Cycles (5)

19. Communication Theory

19.1 Random Codes (5)

20. Probability

20.5 Percolation and the Invasion Process (9)
20.6 Loss Networks (9)

23. Astrophysics

23.5 Ionization of the Interstellar Gas near a Star (8)
23.6 Accretion Discs (8)

see CATAM manual

Project Units

Each project is allocated a number of *units* based on its difficulty

From the CATAM Manual:

To obtain maximum credit, you should submit projects with unit allocations that sum to 30 units. If you submit N units, where $N > 30$ (i.e. if you submit more then the maximum number of units), then the following algorithm applies:

> If your weakest project is M units with $M > N - 30$ then the mark on that project will be rescaled by $[M - (N - 30)]/M$. If $M \leq N - 30$ then that project will be discarded entirely, a revised N will be calculated, and the algorithm will be applied recursively.

see Schedule and CATAM manual for more detail

Deadline — Part II

Wednesday 1 May 2023, 4pm

- There are many reasons to work diligently and finish well ahead of deadline

  - to deal with unforeseen problems including graphs, tables, program listings

  - to *proofread* your submission

  - to have ample time to upload report to Moodle

- Be aware some projects link more closely than others with lecture courses,

  e.g. 3.1 Boundary Layer Flow is closely linked with Part II Fluid Dynamics.

see CATAM manual for more detail

Academic integrity

- All of you work very hard studying mathematics
- You have earned an examination procedure which respects your efforts
- Achievement of tripos marks by unfair means is an insult to all of you
- We promise to protect the academic integrity of CATAM

Unfair means

Unfair means includes (but is not limited to):

- Copying any person's program
- Using someone else's program or any part of it as a model, or working from a jointly produced detailed program outline
- Using generative AI (ChatGPT, Bing, Bard, etc) to produce some or part of write-up or source code
- Copying or paraphrasing someone else's report in whole or in part
- Posting questions on the internet, e.g. StackExchange
- Sharing your work with other students (including future years)

If in doubt, contact us via catam@maths.cam.ac.uk

see CATAM manual for more detail

Plagiarism detection

- Unfortunately, upholding Academic Integrity means we all have to undertake some administrative tasks
- Submit **code/programs electronically**
  - Comparison with projects submitted this year *and previous years*
- Produce & submit **write-up electronically**
  - Checked against Turnitin database
  - Source code checked with MOSS
- Student declaration form (e-mail to be sent soon)

see CATAM manual for more detail

Consequences of unfair means

From the manual:

If the Chair of Examiners deems that unfair means were used, the case may be brought to the **University courts**. According to the Statues and Ordinances of the University [14]

> suspected cases of the use of unfair means (of which plagiarism is one form) will be investigated and may be brought to one of the University courts or disciplinary panels. The University courts and disciplinary panels have wide powers to discipline those found to have used unfair means in an examination, including depriving such persons of membership of the University, and deprivation of a degree.

If you assist someone else in using unfair means (e.g. by providing your report or computer code), you may also be subject to discipline.

see CATAM manual for more detail

Returning from intermission

- If you are returning from intermission that began in an academic year when you submitted some or all of CATAM projects, then you might be able to use some/all of your previous marks.
- **Important**: discuss your options with your DoS.
- Your DoS will need to contact catam@maths.cam.ac.uk and the Undergraduate Office to discuss the chosen approach.
- You must do this **before** the submission deadline.

Electronic submission

- Submit your code and write-up electronically
- Free to produce your write-up using
  - LaTeX — see LaTeX guide
  - Microsoft Word
  - LibreOffice/OpenOffice
  - most any word processor (see CATAM manual)
- ***Not permitted:*** anything scanned

Please see CATAM manual

For any questions, contact

CATAM helpline:

catam@maths.cam.ac.uk

Have a great year!