Academic Guide

Guide Aim

With so many courses on offer at M.I.T, knowing how the system works, and making the correct course choices is possibly the most important decision you will make this year. The sources of help are equally diverse – advisers from both ends, student course guides, the course bulletin plus endless personal perspectives from people you will meet along the way. The purpose of this guide is to give a no bullshit assessment of which courses are hot and which are not from an exchange student's perspective. After all, we are the ones who have sat through the 14 weeks of hell/fun and are able to see the value of these courses when returning to Cambridge. We will give a brief overview here of how the system works at M.I.T. followed by more detailed reviews of courses in as many subject areas as possible.

The MIT Way

MIT is a university with 6 academic schools. Each school consists of various affiliated department, each of which is known by its name and course number, e.g. Mechanical Engineering is Course 2. In fact, almost everything inanimate goes by numbers at MIT: class rooms, buildings, departments, subjects, etc.

By "declaring a major" in the sophomore (second) year, a student states his or her intent to specialise in a particular field, e.g. Chemical Engineering, and becomes affiliated to the corresponding department. But majoring in a course does not limit a student's choice of subjects. Quite the contrary, MIT students have to fulfil a minimum requirement of subjects outside their major, while taking a suitable combination of subjects within their major, in order to graduate.

The academic year consists of 2 semesters: Fall and Spring. Each semester has exactly 65 class days, spread over 14-15 weeks, including numerous (and most welcome) short breaks during the semester.

Course Elements

Lectures and Recitations

Talking and thinking out loud in class is encouraged at MIT. Class participation even makes up a certain percentage of your final grade in some courses.

Most courses require textbooks where the lecture material and homework may be based on the text. This is a shock to unsuspecting Cambridge students accustomed to lecture handouts, having to suddenly fork out some pennies for textbooks. These are almost always much cheaper to buy in the UK than in the US. "The Coop" is often the place where a lot of students buy their books, mainly for convenience or "Quantum Books" which is a slightly cheaper alternative. A better bet is to use online vendors such as Amazon who will give you a good deal even including delivery. Many students who have previously taken the course will be happy to lend you their book for the term. This can be helpful if four courses all require textbooks since the costs could run into hundreds of dollars for the course readers alone.

Class sizes vary. As a general rule of thumb, the more specialised the course, the fewer the number of pupils. Sometimes there are only about 10 students for the more advanced courses. When the total class size is in the hundreds, some courses split their classes by offering both lectures and recitations for students to choose; a recitation is simply a class with a smaller group of pupils, usually but not always taught by a graduate student. The term "recitation" is misleading – such classes can be more interactive and easier to follow. Students are allowed to try recitation styles during the first few weeks, and can change sections before making a final choice.

Problem Sets

Problem sets are the MIT equivalent of Cambridge examples papers. Unlike examples papers, however, problem sets at MIT come without cribs – a horrifying thought, if not for the fact that they are usually less demanding in terms of theoretical depth. However, mind-numbing number crunching can get on anyone's nerves, more so on the night before the due date. When this occurs, it makes one wonder if there is any useful purpose to such tedium. Except for getting a good grade, the answer is probably no. Fortunately, not all problem sets are fiendishly tedious. The teaching assistant (TA) of the course, usually a graduate student, is tasked with grading problem sets and having your learning curve graded is a weird experience. TAs are not unknown for grading errors, which is why you should speak up if you suspect an error. But don't get too stressed with below-par grades. Usually problem sets account for only 10-20% of the final grade, which when divided by the total number of problem sets, means that each problem set is no big deal, really. "Off-form" days are to be expected anyway. In other words: relax, dammit!

Academic Support

Academic support is provided in the form of "office hours", during which the course lecturer and TA are available for help. Unlike Cambridge supervisions however, office hours at MIT are not compulsory, nor exclusive. The importance of being earnest could not be over-emphasised. There is no such thing as shame when seeking help on problem sets. Styles for these office hours vary depending on the instructor. Hours range from a fully interactive session to the instructor simply working through problems on the board. Nevertheless this is probably the only opportunity for close contact with a supervisor for the kind of support you would be used to in Cambridge.

Exams

Some classes have three or four exams/quizzes whereas others have the more traditional midterm and final exam approach. The final exam (called the "final") is often longer (3 hours) and weighted more heavily than the midterm (1-2 hours); in some classes, equally weighted "quizzes" held throughout the term count towards the final grade. Some exams are "open-book" and "open-notes", which means that you can take anything you want into the exam (and do your final revision at the same time, if you must). But in other exams, Tripos-type conditions prevail. Basically, examination practices vary widely from class to class. Some people like to choose classes without finals so that there isn't much pressure at the end of term, but finals at MIT are not as stressful as Tripos exams at Cambridge. The final might even be an opportunity to pull up your grade considerably – it all depends on the person.

Examinations are held in classrooms, multipurpose halls or the central gym. Often, there is sufficient space to work in. Graded quizzes are handed back in class or recitation, except in the case of finals. Your final grades can be found on "Websis" (http://www.student.mit.edu), the student information site.

Choosing Courses

CME students do not graduate from MIT so there is a great deal of flexibility in terms of subject choices. A wise idea, however, would be to choose "core" subjects which correlate to those back in Cambridge, and build your timetable around these subjects. Having started this way you will quickly discover that while there are no limits imposed by the system, in practice, a clash of class schedules will limit your options. Advice on choosing subjects at MIT can be obtained from your CME Course Advisor in Cambridge, or from your predecessors (that be us), who are probably more in-tune with current events. A review of courses taken by exchange students this last year is included at the end as a useful guide for those preparing for next year.

A "Course Guide" is issued at the beginning of the semester, complete with subject descriptions and up-to-date class schedules. You are likely to meet your MIT Undergraduate Advisor to discuss your choice of subjects before finalising them – this meeting is usually arranged within the first week of your arrival. To make the task less daunting at the last minute, it would be preferable to have a shortlist of subjects before coming to MIT. Subject descriptions are available online at http://student.mit.edu, just click on the link to "Subject Offerings and Schedule".

Generally courses are taught very differently at MIT. Course instructors (lecturers) are given a great degree of freedom to shape their own courses in terms of syllabus, teaching and grading methods. Because of this, the level of difficulty and teaching styles employed vary considerably from subject to subject.

Assessment of student performance at MIT is usually a continuous process. A course can be graded in terms of quizzes (mid-term exams), problem sets

(examples papers), class participation, labwork, projects, presentations and final exams. The grading structure varies from course to course. It is outlined in the "Course Guide" handed out at the beginning of term – it is recommended that you look into this to understand the grading structure of your courses. Continuous assessment can mean a continuous flow (or torrent) of work, but it also means less stress towards the end of the year.

Credit for each course is denoted in terms of "units", which represent the hours of work expected per week, give and take quite a bit. Course units are broken down into lectures, labwork and homework; hence a "3-0-9" units course entails 3, 0 and 9 hours per week of lectures, labwork and homework respectively. The standard advice is to take a total of 48 units per semester. But this serves only as a guide. Some students take less and others, much more – up to 72 units in fact. Rumour has it that those who bring so much to bear upon them are very, very busy people. But it is possible to add or drop subjects along the way, so no harm in experimenting at the beginning. Indeed it is recommended to start with 5 classes at least with an intention to drop one which you like the least.

Instead of being "classed" Cambridge-style, students obtain a Grade Point Average (GPA), which at MIT, unlike the rest of the world, is on a scale of 0 to 5 (rest of the world: 0 to 4). What is a GPA? A student obtains a final grade (A, B, C, etc.) for each course taken. Each grade is assigned a certain number of points: an A is 5 points, B is 4, etc. The GPA is – as its name suggests – an average of all grade points obtained. For those obtaining a Bachelor of Arts (BA) degree at Cambridge from their year at MIT, a GPA of 3.5 (as of 2002) is the qualification mark for engineers, which may appear tough, but isn't really provided you don't slack off completely!

Course Types

HASS Courses

An interesting experience for many CME students is to venture into subjects beyond their major. Most of these are offered by the School of Humanities, Arts and Social Sciences, hence they are called HASS subjects. Introductory courses often open up whole new worlds of thought and reasoning to engineers and scientists, including economics, management, history and psychology. There are hundreds of courses to choose from, so you are bound to find something to suit your tastes and interests.

Grad Courses

Some of you may be required or advised to take graduate courses while at MIT. These certainly have a different feel to undergraduate courses, from the questions asked during lectures to the teaching style and background required for the course. Many may often seem too theoretical but the material is certainly within reach of any good Cambridge undergraduate. There is far more respect and flexibility for those taking more advanced courses.

Sloan School

During your time at MIT some of you may wish to take one or two subjects in management in association with the Sloan School of Management. The Sloan School is happy to welcome CME undergraduates to its classes, subject to some constraints. As a general rule all MIT students (whether or not they are enrolled in a degree program at the Sloan School) must pre-register and bid at the end of each term for every Sloan subject they wish to take during the following term. This bidding process is a prioritized lottery system that is necessitated by a current serious shortfall of classroom capacity at the Sloan School. You will be given list of recommended subjects for undergraduates wishing to take management courses (http://web.mit.edu/cmi/ue/cam-sloan.html). If you are interested in taking a Sloan School subject that does not appear on this list, you should refer to the subject's description in the *MIT Bulletin* to make sure that the subject is not restricted to students in a particular program and to see whether there are any prerequisites for the subject. You should also check with the subject's instructor to see if your enrollment would be appropriate, given your own academic and employment background. Frequently you will be attending class with MBA students and again the feel of the course will be different to any MIT subject you take during the year.

Harvard Courses

MIT students may also cross-register for courses at any professional Harvard school excluding the Business School. Foreign language subjects at Harvard have been especially popular among CME students. The Harvard course listings are available at http://www.harvard.edu/www/academics/. It is a fabulous opportunity once again to break from the intensity of the MIT workload and to try something new. Some key points to bear in mind however, are that the holiday time (e.g. spring break) and also the exam schedules will not coincide with MIT's, the exam week often running a week later with no exceptions for MIT students. 12 units of MIT credit is given to a Harvard class meeting three hours/week and no more than 24 equivalent units are permitted per term. To register, you will need to obtain a registration form from the HASS office and have the Harvard instructor, the MIT faculty advisor, and the Director of the HASS office sign it. More information is available at http://web.mit.edu/hass/www/hrvdcr.html.

UROPs

Undergraduate Research Opportunities Program, that's what the acronym stands for. Hands-on experience is strongly encouraged at MIT. For good reason too: engineers and scientists are not bred to hide away from the real world. And there are very few places where undergraduates are actually given the chance to be a part of a research group.

Be it for pay, for credit, or as a volunteer, UROPs are the way forward if you are interested in experiencing research. And while some research groups may require specific skills, most UROPs do not require extreme specialisation. In

fact, many UROPers actually do UROPs outside their academic field, e.g. an engineer could be doing a UROP in economics. Or you could start a UROP of your own and apply for funding from the CME Office! Getting a UROP is not complicated, but may involve some extra effort. Which field of research interests you most? If you can decide on a specific area, then looking for a UROP on the MIT web is pretty straightforward. Most research groups have their own webpages. Even if the webpage doesn't advertise a UROP position, there is no harm asking.

For further information on UROP, go to: web.mit.edu/urop

IAP

The Independent Activities Period, or IAP, runs for 4 weeks in January. Officially, it serves the purposes of promoting student faculty interaction, encouraging new methods of teaching and learning, and strengthening the sense of community at MIT. To a student it is really an opportunity to do the kind of activities that interest you but in a more relaxed and hectic-free environment. From sporting activities to art classes or leadership events, there is a broad range of fun activities to choose from. You could do academic subjects for credit (limited to 12 units), learn from fellow students on specialised topics like programming, or participate in some events just for fun! You could also organise your own activities and invite others from within the MIT community to take part.

An IAP Guide will be published in the Fall semester, so look out for it. It will include a list of subjects offered, and instructions on registration.

For further information on IAP, go to: web.mit.edu/iap/

Course Guides

Course 2 – Mechanical Engineering

2.007 Design and Manufacturing (U)

Difficulty:	*8.0/10.0*
Lecturer:	*Alex Slocum*
Terms Offered:	*Spring*
Term Evaluated:	*Spring 2004*
Prerequisites:	*None*
Time Commitment:	*3-6-5*

Course Overview
The course is similar to IDP in that it involves designing a robot to compete in a competition at the end of the term. The main differences are that this is an individual design and the machine is controlled manually rather than automated, which means that much more of the focus is on the mechanical design and no software is involved. The course emphasizes the use of a systematic design process, the FRDPARRC table.

Lecturer – Alex Slocum
A very inspiring, energetic and eccentric lecturer. He makes the whole design process seem incredibly easy and provides an excellent set of lecture notes to accompany his memorable lectures. There is no other lecturer like him.

Breakdown of Grades
Design Project: 100%

Plusses:
- Resources available; the workshop, the tools and materials.
- A lot of support is provided by the various teaching staff, workshop staff, undergraduate advisors and Prof Slocum himself.
- The competition is a huge event with a chance to enter the International Design Contest.

Minuses:
- The time spent in the lab can be a lot more than you expect.

2.008 Design for Manufacturing II (U)

Difficulty: *4.0/10.0*
Lecturer: *Jung-Hoon Chung*
Terms Offered: *Fall, Spring*
Term Evaluated: *Spring 2005*
Prerequisites: *None*
Time Commitment: *3-5-4*

Course Overview
Integration of design, engineering, and management disciplines and practices for analysis and design of manufacturing enterprises. Emphasis is on the physics and stochastic nature of manufacturing processes and systems, and their effects on quality, rate, cost, and flexibility. Topics include process physics and control, design for manufacturing, and manufacturing systems. Group project requires design and fabrication of parts using mass-production and assembly methods to produce a product in quantity. Six units may be applied to the General Institute Lab Requirement.

Lecturer –Prof. Chung
At times monotonous, Prof. Chung is responsive to class feedback and tries to make the course as interesting as possible. Throws in the odd bit of humour and gives out chocolate bars midway through most lectures.

Breakdown of Grades
2 Quizzes: 40%
Lab & reports: 30%
Homework: 15%
Presentation: 15%

Plusses:
- Well-equipped lab
- Superb lab tech's
- Broad range of topics covered

Minuses:
- Some overlap with part IB knowledge
- Homework is often tedious token-gesture
- One of the TA's is almost unitelligible

2.009 The Product Engineering Process (U)

Difficulty: *6.0/10.0*
Lecturer: *David Wallace*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *3-3-6*

Course Overview
Students develop an understanding of product development phases and experience working in teams to design and construct high-quality product prototypes. Design process learned in 2.007 is placed into a broader development context. Primary goals are to improve ability to reason about design alternatives and apply modeling techniques appropriate for different development phases; understand how to gather and process customer information and transform it into engineering specifications; and use teamwork to resolve the challenges in designing and building a substantive product prototype. Instruction and practice in oral communication provided.

Lecturer –Prof. Wallace
The Canadian, Prof. Wallace is quite a character. It took the arrival of Boston snow to get him from shorts into trousers and even then he'd come in in shorts! The actual lectures are not that essential to the course as the majority of the time is spent in lab. When he is delivering lectures they are usually pretty memorable.

Breakdown of Grades
Brainstorming: 5%
Design notebook: 15%
Peer Review: 10%
Idea Review: 5%
Sketch Model: 15%
Mock-up review: 15%
Assembly model: 5%
Technical review: 20%
Presentation: 10%

Plusses:
- You really have the freedom to whatever you want for your project
- Use your team mentors – they are very valuable resource

Minuses:
- The lab will take over your life unless you are very organised both as a team and individually

2.12 Introduction to Robotics (U)

Difficulty: *6.0/10.0*
Lecturer: *Harry Asada*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *3-3-6*

Course Overview
The course covers the dynamics and control theory behind robotics. The dynamics equations are first derived and then applied to various example of robotic arms. The main theory consists of the Netwon –Euler equations and the Lagrangian equations. The lab project is to program a robot similar to the IDP robot using C++. The robot contains optical encoders on the wheel and a two degree of freedom robotic arm. The robot enters a competition with a theme. The themes included the removal of mines from a minefield and the delivery of presents at Christmas.

Lecturer –Asada
Prof Asada knows the subject well, but it was not always easy to understand his English.

Breakdown of Grades
Mid term exam: 30%
Final exam: 30%
Problem sets: 20%
Lab and design project: 20%

Plusses:
- Lectures and problems sets were integrated well.
- Good comprehensive lecture notes were provided, as well as fully worked solutions to all the problem sets.

Minuses:
- A lot of time can be spent debugging the robot in the lab if your C++ skills are not honed.

2.25 Fluid Mechanics (H-Grad)

Difficulty: *6.0/10.0*
Lecturer: *Gareth Mckinley*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *3-0-undefined*

Course Overview
Covers all the standard topics of Fluid Mechanics. No compulsory homework.. Tripos style exams. It is "adequate preparation to PhD qualifiers exam".

Lecturer –Asada
He is a Cambridge graduatre and is very very sharp. His lectures are inspirational no less, although he teaches at warp speed at the students' peril. This course will give you a thorough grounding in Fluid Mechanics

Breakdown of Grades
2 Mid term exam: 25%
Final exam: 50%

Plusses:
- Inspirational teaching
- Thorough treatment.

Minuses:
- Overlaps with 16.100, also requires self-motivation.

2.72 Elements of Mechanical Design (U)

Difficulty: *7.0/10.0*
Lecturer: *Dan Frey, Doug Hart, John Leonard*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *3-0-9*

Course Overview
The course takes an analytical approach to the design of machine elements such as bearings, gears and transmissions. Initially, the lectures make use of MathCAD to analyze and synthesize the motion of various mechanisms. Then the various machine elements are introduced in the context of a single robot design contest. A six legged robot is to be constructed and programmed to walk by a team of three. Then each team is asked to redesign the robot for a tug of war contest against other teams. The course emphasized the use of a modelling and analytical approach to optimize the design rather than totally redesign the system.

Lecturers
Frey: An excellent lecturer who is also very helpful during office hours.
Hart: Told some interesting facts and amusing stories, but rarely taught anything useful.
Leonard: Very disorganised and frequently made mistakes.

Breakdown of Grades
Assignments: 60%
Project: 40%

Plusses:
- A lot of hands on work was involved in building the robot.
- The robot tug of war contest was a lot of fun.

Minuses:
- The lectures were very disorganised in general.
- The problem sets were vague and not very well thought out.

2.96 Management in Engineering (U)

Difficulty: *6.0/10.0*
Lecturer: *Chun*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *3.0-0-9.0*

Course Overview
Teaches the basics of how to start a successful engineering company by focusing mainly on the financial aspects, such as how to read a financial report. The course illustrates the principles involved by means of descriptions of how successful companies have operated in the past. The final project is the creation of a business plan in a team of about six based on whatever area the group chooses.

Lecturer – Chun
Has a good knowledge of the subject as well as many examples from past and recent start up companies. He often encourages class participation and is always open to answering questions.

Breakdown of Grades

Quiz:	30%
Case Studies:	40%
Final Project:	30%

Plusses:
- Chance to create a business plan that could actually be used to start up a business or entered in the MIT's 50K competition.
- Extra lectures from business experts who have started up many engineering companies, including a cameo from Alex D'Arbeloff, an angel investor who gave some excellent lectures on communication

Minuses:
- Course book consists of an unstructured collection of case studies and does not make for interesting reading.
- The lectures could be more organised.

2.670 Mechanical Engineering Tools (U)

Difficulty: *5.0/10.0*
Lecturer: *Doug Hart*
Terms Offered: *IAP*
Term Evaluated: *IAP 2005*
Prerequisites: *None*
Time Commitment: *0-5-1*

Course Overview
The course teaches you how to use the workshop machines in the two main workshops at MIT. It also covers hand drawings, solid works and Matlab. The whole course works towards assembling a Stirling engine which is run in a competition to find the most aesthetically pleasing engine and the fastest spinning engine.

Lecturer – Doug Hart
The lectures briefly describe the safety issues and the physics behind the Stirling engine. Lectures are interesting but not particularly informative.

Breakdown of Grades
Drawing, Matlab and Solidworks assignments: 100%

Plusses:
- Resources available; the workshop, the tools and materials.
- You get to keep a toolbox given to you for the course.
- You can customise the engine as much as you like and keep it at the end.

Minuses:

2.671 Instrumentation and Measurement (U)

Difficulty: *7.0/10.0*
Lecturer: *Ian Hunter*
Terms Offered: *Fall/Spring*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *3-3-7*

Course Overview
The course starts with basic experimental techniques in making accurate measurements in the lab and then goes on to introduce various kinds and sensors and actuators that currently used. The course is communication intensive and so there are many marks allocated for making contributions in class and presentation skills. The course provides plenty of practice in writing structured scientific reports based on the experiments done in lab. The course also teaches you how to use MathCAD to analyse data using signal analysis techniques. This course is ideal for students who feel they have very little experience in using lab equipment and would consider a career in the experimental side of engineering.

Lecturer –Hunter
He knows everything there is to know about instrumentation. The lectures are always very well organised and include interesting demonstrations and questions. The most informative lecturer I had at MIT.

Breakdown of Grades
Quizzes: 25%
Labs: 16%
White papers: 18%
Journal Article: 15%
Oral reports: 16%
Lab notebook: 5%
Class participation: 5%

Plusses:
- Laptops are provided for the course for the duration of the term.
- The lectures are interactive in the sense that you download a MathCAD file and edit as the lecture proceeds.
- Each lecture begins by Prof Hunter bringing in a strange object and asking what it is (for a small prize).

Minuses:
- The first few labs may seem quite patronising if you already know the basics of electronic instruments.
- Most labs will require preparation to get them done on time.

2.672 Project Laboratory (U)

Difficulty: *8.0/10.0*
Lab instructor: *Thorsen*
Terms Offered: *Spring*
Term Evaluated: *Spring 2004*
Prerequisites: *None*
Time Commitment: *0-4-3*

Course Overview
The course contains fluid mechanics based labs that involved creating a Matlab model to simulate the problem and refining the model after collecting and comparing experimental data.

Lab Instructor – Prof Thorsen
Provided very little guidance throughout the labs and was unable to explain the purpose of the experiments clearly.

Breakdown of Grades
Lab report 1: 20%
Lab report 2: 20%
Oral Presentation: 20%
Lab participation: 40%

Plusses:

Minuses:
- The labs are all based on fluids and thermodynamics problems. There are no solid mechanics experiments.
- The level of fluids theory required is more detailed than that taught in the CUED course.

2.790J Introduction to BioEngineering (U)

Difficulty: *4.0/10.0*
Lecturer: *Paul Matsudaira*
Terms Offered: *Spring*
Term Evaluated: *Spring 2004*
Prerequisites: *None*
Time Commitment: *2-0-4*

Course Overview
The course introduces the bioengineering related research from professors of various departments around MIT. It is mainly aimed at freshmen considering whether to take the new Bioengineering degree program.

Lecturer – Various
The range of styles varied greatly from professor to professor.

Breakdown of Grades
Bioengineering paper: 100%

Plusses
- Only one assignment.

Minuses:
- The course was totally different from its description. There were no Matlab assignments and no useful theory.

An MET Perspective

Required courses

Fall	**Importance**	
2.009	1	The product engineering processes
2.853	1	Manufacturing Systems I: Analytical Methods and Flow Models
2.760	3	Multi-scale system design
15.011	1	Economic analysis for business decisions
IAP		
2.670	2	Mechanical engineering tools
Spring		
2.008	1	Design and manufacturing II
15.501	2	Introduction to financial and managerial accounting
15.660	2	Strategic Human Resource Management
3.52J	2	Materials processing

This combination of courses offers a pretty good coverage of the MET syllabus. The weakest areas are human resources, metallurgy and ceramics and failure analysis.

Your advisor here will be Prof. Gareth McKinley (gareth@mit.edu). Although he is knowledgeable about the mechanical engineering courses (course 2), the management side (course 15) is not his field and so you should look to the course catalogue for information. When you register for your courses you will not have any trouble registering for the mechanical courses, but for the management courses it is slightly harder.

The way management courses work, there are some courses that any undergrad can take and others that are really only for Sloan (course 15) students. There is usually a lottery system to determine who gets on the course. This is all very well if you have the luxury of four years to take a course, but in your case, you have to take it in the two semesters that you're here. If you get in touch with the professors teaching the courses early on and explain your situation, then it is usually not a problem for them to sign you on to the course.

Course overview

2.009 and 2.008 are lab-based courses. This means they will take up quite a bit of your time and you probably will only want to take one lab course per semester if you are to remain sane! These courses are where MIT comes into its own, with more resources on offer than Cambridge, the labs are well equipped and you'll have great fun making real products. It does not matter that you have to take 2.009 before 2.008.

Manufacturing systems I is a comprehensive look at inventory, queues, scheduling and modelling of factories. The year I took it, it was taught in

conjunction with Singapore University. For half the term the professor was at MIT and for the remaining half he lectured from Singapore via video link. This style of teaching takes some getting used to.

The multi-scale system design course culminates in manufacturing a scanning tunnelling microscope (STM) in small groups. I did this course as a listener, meaning that I did not do any problem sets or make an STM, rather I just sat in on the lectures in the first half of the term. These lectures gave me an interesting insight into MEMS fabrication and the considerations for MEMS design. The course actually clashed with my 2.009 lab sessions and so I had to miss half hours of lectures here and there.

Economic analysis for business decisions was an engaging course that took many of the graphs that are thrown at you in the second year engineering economics class and gave them real meaning and gave you an intuition about them.

During IAP, the 2.670 course takes up either the first two or last two weeks of January. You get an introduction to nearly all the machines in the tool shop. You'll also go over drawing and Matlab skills that you'll have done in Cambridge already. I really enjoyed the course because we built Stirling engines in the shop.

Design and manufacturing II is a really important course to take. It seems to exclusively cover METI material without 'wasting' time covering areas that are outside the MET syllabus. During the course you will learn how to use the numerically controlled machines and then use them to produce paperweights and yo-yos.

Introduction to financial and managerial accounting gives you a broad view of a company's financial statements and how they should be interpreted. If you have done business studies before coming to Cambridge, then this course will not teach you much.

Choosing your subjects

The courses I have suggested are only meant to be a guide. I would strongly recommend that you take the courses that I marked as most important (1).

Course 5 – Chemistry

5.04 Inorganic Chem II

No. of units: 12
Prerequisites: Bit of Group Theory, physical chem. and inorganic chem. is useful

Lecturer: Nocera
Quite an entertaining lecturer. Lecture notes were pretty good.

Course description:
Group Theory. Starts off with revision of point groups, symmetry elements and operations. Then you do Huckel Theory and construct MO diagrams and do energy calculations on them. Afterwards its basically lots of different ways of using group theory to construct MO diagrams for different molecules. At the end there's applications of group theory to spectroscopy and some quantum mechanics thrown in.

Should you do this course?
Its quite useful to be able to construct these MO diagrams. You should be reasonably well prepared for the course. Its certainly more depth than Group Theory in Part IB. There are lots of graduates in this class for some reason.

Assessment:
Pset most weeks. Psets could take a long time, don't spend too long on maths and calculations. They're only graded on a scale of 0-3 so not too much pressure. Three tests and no final. The hardest thing about the tests is the time pressure so make sure you get quick at doing problems.

Time commitment:
Depends on whether you had a pset, but probably around 12 hours.

5.07 Biological Chemistry I

No. of units: 12
Prerequisites: Basic organic chem.

Lecturer: Kemp / Licht
Kemp was ok. He did the first half of the course. He liked to give workbooks out to do before psets, it took a while to do them but made the psets a bit easier.
Licht did the second half which was a bit more interesting. No workbooks this time

Course description:
Starts off with proteins, structure etc, lipids and membranes. If you've taken Biology of Cells or any biochem you've done some of this before, it's a bit dry. Then it goes on to talk about haemoglobin in a lot of detail. Then there's sugars and enzyme kinetics. After that its cofactor catalysis (PLP, NADH, TPP, quinones, flavins etc) – this is probably the most important part since they do it in Cambridge in Part II.

The second half of the course is metabolism, lots of it. Glycolysis, TCA cycle, gluconeogenesis, fatty acid oxidation and synthesis, electron transport, glycogen synthesis and breakdown, and photosynthesis. Finally at the end there's a bit on nucleic acids.

Should you do this course?
Probably not if you've done Part IB Biochem. However I did IA Cells and IB MCB and I still needed to take this course. There was a fair bit of repeated material for me, but also lots of new stuff and certainly everything in more detail than I'd done before and from a chemistry rather than a biological perspective as I'd done it before.

Assessment:
Pset every week, 4 tests and one final. Psets generally aren't too bad. Neither are the tests, you get to take in cheat sheets. However you need to get high marks to get an A as everyone does pretty well on the tests.

Time commitment:
Probably spent a bit less than 12 hours a week

Plusses:
Mostly pretty interesting. Not too hard.

Minuses:
8.30am lectures

5.08 Biological Chem II

No. of units: 12
Prerequisites: 5.07

Lecturer: Joanne Stubbe/Alice Ting
Prof. Stubbe is enthusiastic but her lectures are hard to follow, she jumps around all over the place. Ting's lectures are more organised.

Course description:
There are 4 modules:
1) Fatty acid syntheses and similar systems. Basically fatty acid metabolism.
2) Ribosomes and G proteins.
3) Crypts and Chambers (protein folding).
4) Metal homeostasis.

You have to read a few papers for each module and for the T&D sessions. The stuff is pretty interesting. The T&D sessions focus on going through a paper from the literature and looking at experimental methods.

Should I do this course?
I'd recommend it, it's the most interesting one I've done so far.

Assessment:
There are psets but they aren't graded. There are 4 exams and a final. The exams haven't been too bad and you get a decent amount of time for them.

Time commitment:
The lack of psets makes it time efficient, but it depends whether you religiously do all the reading.

5.33 Advanced Experimental Chemistry & Instrumentation

No. of units: 21
Prerequisites: Physical chem.

Lecturer: Tokmakoff
Lectures didn't seem significant at the time as they were all at the beginning and we hadn't done most of the experiments by that time.

Course description:
There's four experiments:
1) IR of acetylene – you take the IR spectrum and do a long and very tedious analysis of it. There is an oral powerpoint presentation plus you have to semi-write up your analysis.
2) Nitrogen scission experiment. You spend a long time in lab, there's a couple of organic reactions and then you do the scission in the glovebox. You have to read a few papers on it and then there's a chalk-talk oral presentation.
3) NMR/ESR. You spend a couple of afternoons taking the spectra and then analyse them. Not too bad, it's another chalk-talk presentation.
4) FRET experiment. You do a couple of afternoons on a laser experiment and then a very lengthy analysis and written report. You pretty much have to analyse your data on Matlab which is a nightmare if you don't know how to do it, as they didn't really give many instructions.

Should you do this course?
You have to. It is pretty useful, its just annoying because it is pretty stressful and time consuming.

Assessment:
All presentations and the written report. They ask you questions at the end of the presentations. You should be well prepared with the physical chem. side of things. A stressful course and not easy but if you do the work getting an A isn't too hard.

Time commitment:
Its ok in the weeks when there is no presentation/report due, but when there is its really very time consuming, probably more than 21 hours anyway.

5.43 Advanced Organic Chemistry

No. of units: 12
Prerequisites: You have covered most of it in 1A and 1B but there are a couple of things you haven't done, such as pericyclic reactions. I haven't found that to be much of a problem, you could look it up before you start the course, otherwise just look it up as things come up.

Lecturer: Movassaghi and Buchwald
Movassaghi is pretty thorough and his notes are good. He gives quite a lot of reading though and it can be hard to figure out which parts of the reading are relevant. Otherwise I thought he was a good lecturer.
Buchwald tries to be funny, often he fails. Anyway, his part of the course involved learning lots of syntheses which was frustrating and his notes were a little more sketchy.

Course description:
Movassaghi: Starts off with stereochemistry and determining reaction mechanisms which is pretty straightforward. Then goes onto radical chemistry and photochemistry, I found this a bit more confusing.
Buchwald: Heterocyclic chemistry and some organometallic stuff. I think this is a useful part of the course since I've noticed something similar in one of the part III courses. However, it involves a lot of learning. Its less mechanistic and more 'show what you would use to make this'.

There are three assigned books for the course, all of which I find pretty awful, and they aren't cheap. Buchwald doesn't assign specific reading, and the book he uses doesn't really help with psets as it just states facts but doesn't explain them.

Should you do this course?
If you're an organic chemist, obviously you should, and probably if you're a biological chemist it is useful too. I think it will be good preparation for Part III, however bear in mind that since this is pretty much the only organic course at the right level for CME people, there may be thing, such as retrosynthesis, to catch up on over the summer. I don't find this a particularly easy course, you tend to have to be active in sorting out problems you have (e.g. go to office hours etc) as there are no exam review sessions. It is a pretty interesting course.

Assessment:
Pset about once every one-and-a-half weeks. Three exams plus final. The exams are all one hour, you have to work pretty fast to get all the questions done. The second two were fairly difficult.

Time commitment:
I didn't do all the reading, but the psets are quite time consuming. If you want to do well you probably need to spend extra time going through things and doing the reading, rather than just doing psets.

5.46 NMR and Organic Structure Determination

No of units: 6
Prerequisites: Some NMR, mass spec, IR etc.

Lecturer: Jamison
Pretty thorough notes. The book he assigned is good. He often seems to cover simple concepts in class, yet the psets have more difficult problems.

General description:
Starts off with mass spec, IR, proton and carbon NMR. Then goes on to 2D methods and other types of NMR.

Should you do this course?
I think since there is no NMR in 5.43 that this is a useful course for organic chemists. It starts off with the basics and gets harder. It's a grad course.

Assessment:
Four psets, two exams and a project. The psets are very long, not really difficult but long. I did this course pass-fail, so haven't spent too much time revising etc.

Time commitment:
The psets took me ages, and if I had been doing this for a real grade, I would have had to spend a lot longer.

5.92 Environmental Chemistry Seminar

No. units: 6
Prerequisites: None really

Lecturer: Steinfeld
He's not an overly exciting professor but I really liked the topics we did so it was interesting anyway.

General description:
You meet for 2 hours every week. You might have a bit of reading to do each week. Basically you can choose what topics you do as it's a small class, we've been doing atmospheric stuff: ozone destruction, climate change and air pollution etc.

Should you do this course?
If you want to do/are interested in atmospheric chemistry or just the environmental implications in general. If you want to do atmospheric in Part III it would be a good idea to take some other physical chem. stuff eg 5.68 (kinetics). I found this course really interesting, its very little work.

Assessment:
You have to write one term paper on a topic of your choice (and its pass-fail).

Time commitment:
Very low. If you have two hours to spare a week for the seminar then you'll be fine.

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You have to write one term paper on a topic of your choice (and its pass-fail).

Time commitment:
Very low. If you have two hours to spare a week for the seminar then you'll be fine.

Course 6: Electronic Engineering and Computer Science

6.001 Structure and Interpretation of Computer Programs (U)

Difficulty: *8.5/10.0*
Lecturer: *W.E. Grimson*
Terms Offered: *Fall & Spring*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *5-3-17*

Course Overview
You learn difference between recursion, iteration algorithms, orders or growth, data structures, higher order procedures (functions that make other functions), searching & sorting, object orientated programming; all done in an obscure language called Scheme. The workload was very high and varied from week to week depending on the timing of quizzes and project deadlines. The course involves 5 substantial programming projects, which can take up to 30 hours each. It is not an EE class, it is CS so you need to be interested in programming. It is far better than part 1 programming, but 1.00 is far less work using Java and still has object oriented content.

Lecturer – W.E. Grimson
He explained things with clarity, but lecture presentation was rushed and the PowerPoint slides contained too much information.

Breakdown of Grades

Two mid-term quizzes:	25%
Final exam:	25%
Projects	30%
Problem Sets	10%
Course participation	10%

Comments
“This class single handedly ruined my first term at MIT, it made my life hell”

6.004 Computational Structures (U)

Difficulty: *4.0/10.0*
Lecturer: *S. Ward*
Terms Offered: *Fall & Spring*
Term Evaluated: *Fall 2004*
Prerequisites: *None*
Time Commitment: *4-3-3*

Course Overview
The subject covers digital systems - from FETS through to operating systems and illustrates the use of abstraction. The course starts slow and very basic, reviewing 1A digital circuits over 5 weeks or so before new stuff takes over covering some of 3F5. Turing machines, virtual memory, pipelining and operating systems are covered in the latter half of the term. The lab assignments essentially build on one another to form a microprocessor by the end of the term, which is very satisfying. The 15 unit time commitment is generous and the quizzes are fair. The number of points required for set grades greatly eases the pressure towards the end of term since it is possible to see how much additional effort is required. A very good class, at least for the last 7 or 8 weeks.

Lecturer – S. Ward
He was a good lecturer, who was knowledgeable, well-prepared and available outside of class although his voice was fairly monotonous. He needed a bit more enthusiasm although the enjoyment of the course did not suffer due to this.

Breakdown of Grades

Five quizzes:	37.5%
Nine Lab Assignments:	62.5%

Plusses:
- Absolute grading system
- A nice easy start
- Something to show from lab at the end of the term

Minuses:
- Too much revision of old stuff for the first few weeks, it will seem very slow!
- Quizzes and labs due in the same week.

6.011 Introduction to Communications, Control and Signal Processing (U)

Difficulty: *7.0/10.0*
Lecturer: *G. Verghese*
Terms Offered: *Fall & Spring*
Term Evaluated: *Fall 2004*
Prerequisites: *IB Signals*
Time Commitment: *4-0-8*

Course Overview

The course is a mixture of signal processing, comms and control. It includes random processes, LMMSE, state space models, hypothesis testing, PAM, DT and CT processing of signals. It covers equivalent parts of 3F1, 3F2 and 3F3 in Cambridge. There are significant shortfalls in knowledge at the start. We haven't done Z transforms, DTFT, not as much probability, regions of convergence. You also feel very rusty but it gets better. It's a reasonable workload of 1 problem set/week. As long as you devote time to this class you will be fine. It is absolutely essential for anyone wanting to do signal processing.

Lecturer – G. Verghese

He was a knowledgeable lecturer who knew the course inside out and the course notes were excellent. However, from lecture to lecture there seemed to be no purpose or goal, rather he turned up to talk about "his area" for 50 minutes. Recitations often helped to put lectures in context. He was friendly and approachable however.

Breakdown of Grades

Homework:	10%
Quizzes:	30%
Midterm:	25%
Final:	35%

Plusses:

- Subject material.
- Recitations.

Minuses:

- Poorly formatted exams.
- Gaps in pre-requisite knowledge for CME students.
- No applications of theory.

6.012 Microelectronic Devices and Circuits (U)

Difficulty: *4.0/10.0*
Lecturer: *C. G. Sodini*
Terms Offered: *Fall & Spring*
Term Evaluated: *Fall 2004 & Spring 2005*
Prerequisites: *IA & IB Linear Circuits*
Time Commitment: *4-2-5*

Course Overview
6.012 is predominantly a device physics class: 2/3 device physics, 1/3 circuits. The circuits stuff we'd seen nearly all before, e.g. CE amplifier, CMOS inverter, diff pair etc. The device physics is equivalent to 3B5. It was taught rather poorly, very slowly, left only to use equations from the course book (which was crap). Problem sets often involved horrendous number-crunching, little insight and tedious equations. The weblabs were again tedious and frustrating to use, and the whole course moved very slowly up until the last week of term.

Lecturer – C. Sodini
Again he knew what he was talking about but almost patronisingly explained things on ridiculously simple levels that made the pace infuriatingly slow. Friendly and approachable too but very hard on deadlines, there was little leeway if you were struggling on account of other workloads.

Breakdown of Grades

Eight p-sets:	15%
Quizzes:	30%
Design Problem and Weblabs:	20%
Final:	35%

Plusses:

Minuses:

- Very slow and tedious lectures, p-sets etc.

Comments:
“Only take if you want to learn devices, if you are just interested in circuit design, take 6.301, its a million times better and more at our level. You are far better off taking 302 in fall and 301 in spring. I only took this because my advisor insisted that all course 6 CMEers take it and its an official pre-req for 301. Don’t - they don’t have a clue what its about, they've just looked at the title. Plus, you don’t need 012 for 301.”

6.101 Introductory Analog Circuits Laboratory (U)

Difficulty: *7.5/10.0*
Lecturer: *R.Roscoe*
Terms Offered: *Fall only (as of 2005)*
Term Evaluated: *Spring 2005*
Prerequisites: *None*
Time Commitment: *3.0-12.0-1.0*

Course Overview
6.101 is an analogue circuits class designed to increase students' ability in the design of complete analogue systems. The work is split between labs, quizzes, problem sets, and a final project. The six labs teach mostly practical tips and tricks, everything from how to use an oscilloscope properly to how to reduce the likelihood of oscillations in a circuit. The labs get increasingly design focussed. Each lab takes between 6 and 12 hours to complete. The lab write-ups are short and simple. The problem sets are short and simple – they mainly test the material taught in lectures, which for the most part is 1A Linear Circuits. The final project is a large design project worked on in groups of three to design an analogue electronics system. (Past examples include FM radios, analogue computers and automatic equalisers.) The material is moved through slowly, but it cements all the basic knowledge and fills any gaps that you might have in your JFET and Bipolar knowledge.

Lecturer – R. Roscoe
Really like design, especially RF (as that was his area during his industry work). Very friendly and fairly enthusiastic, and is not above making jokes in lectures (especially corny technical ones)

Breakdown of Grades

6 Labs, 6 Problem Sets & 3 Quizzes:	50%
Final Project:	50%

Plusses:
- Great lab experience
- A cool final project

Minuses:
- A long time in lab, especially for the final project!
- Lots of circuit debugging

6.111 Introductory Digital Systems Laboratory (U)

Difficulty: *6.5/10.0*
Lecturer: *C. Terman*
Terms Offered: *Fall & Spring*
Term Evaluated: *Fall 2004*
Prerequisites: *IA Digital Circuits, debugging skills, time!*
Time Commitment: *3.0-12.0-2.0*

Course Overview
6.111 is a digital electronics design lab class culminating in a final project worth a large share of the final mark. The course teaches introductory digital circuits, programming FPGA's using Verilog hardware description language and techniques for designing overall systems such as finite state machines. Interfacing with analogue components and other useful circuit ideas are also taught for use in the final project. Labwork consists of 3 set labs to teach increasingly complex design skills in preparation for the final project. In addition there is a CI-M communications intensive component of the class, where writing instructors assess one of the lab reports as part of the grade (usually lab 2). The final project takes up at least the last 4 weeks of the class and constitutes a large part of the overall grade. This will require several deliverable documents as well as a presentation that also counts towards the CI-M requirements. Verilog programming is a large part of the class.

Lecturer – C. Terman
He was absolutely enthralled by design and was genuinely helpful and nice. He lectured well and even cancelled a quiz to enable focus on the final projects. The best lecturer I had at MIT.

Breakdown of Grades

Quiz:	10%
Lab1:	10%
Lab2:	10%
Lab2 (CI-M):	10%
Lab3:	20%
Final Project:	40%

Plusses:
- Great lab experience
- Terman's expertise
- A cool final project

Minuses:
- A long time in lab, especially for the final project!
- Watch out for faulty equipment
- Lots of Verilog and circuit debugging

6.115 Microcomputer Project Laboratory (U)

Difficulty: *4.0/10.0*
Lecturer: *S. Leeb*
Terms Offered: *Fall & Spring*
Term Evaluated: *Spring 2005*
Prerequisites: *1A digital circuits*
Time Commitment: *3-12-1*

Course Overview
This is a project based course introducing the analysis and design of embedded microprocessor systems through a series of laboratory assignments, culminating in a final design project chosen by the student. The course teaches assembly programming, microprocessor system architectures, use of microprocessor compatible peripherals, and the modelling and control of electromechanical systems. Applications explored range from communications and signal processing to interface and power electronics, giving the student the chance to work with some really exciting hardware such as a five axis robot arm and a basic tomographic imaging station. The course is not difficult, but you must be prepared to devote a lot of time to wiring up circuits and debugging assembly code. Overall, this is a really useful class for anyone interested in learning some practical electronic engineering.

Lecturer – S. Leeb
Excellent lecturer, enthusiastic, energetic and gives great explanations as well as demonstrations. Very approachable and caring.

Breakdown of Grades

5 Projects:	50%
Mid-term:	25%
Final Project:	20%
Attendance:	5%

Plusses:
- Interesting projects
- Everything you learn is practically applicable

Minuses:
- Not theoretically challenging

6.152J Micro/Nano Processing Technology (U)

Difficulty: *6.0/10.0*
Lecturer: *T. Akinwande & R. O'Handley*
Terms Offered: *Fall & Spring*
Term Evaluated: *Spring 2005*
Prerequisites: *IB Electrical Engineering Elective*
Time Commitment: *4-2-5*

Course Overview
This subject covers micro/nano fabrication technology through lectures and lab assignments. The class teaches the basics of fabrication. There are 9 lab sessions scheduled in the clean rooms where 3 devices are made: an MOS capacitor, a micro-cantilever and a micro-fluidic mixer. The techniques used are covered in lectures, together with some more advanced topics at the end of term. The general background of CME students definitely puts them at an advantage in this class. There is a lot of report writing and some long sessions in clean rooms but there is a lot to be learned from this class.

Lecturer – T. Akinwande
Good lecturer and very enthusiastic about the course, his slides were useful and taught well for his part of the term.

Lecturer – R. O'Handley
Awful, didn't know his stuff, his slides were cluttered and impossible to understand, never organised or prepared or confident in his material.

Breakdown of Grades

Eight p-sets:	10%
Quizzes:	40%
Labs:	50%

Plusses:
- Working in state of the art clean rooms.
- You get to take home what you make in the lab.
- Real engineering application

Minuses:
- O'Handley.

6.301 Solid State Circuits (G)

Difficulty: *6.5/10.0*
Lecturer: *J. Roberge & K. Lundberg*
Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Prerequisites: *IA & IB Linear Circuits*
Time Commitment: *4-5-5*

Course Overview
This course covers analogue circuit design and analysis in MOS and bipolar transistor technologies. It includes many design concepts and is an extremely useful course in practical circuit design, covering open circuit time constants, high-frequency and low-frequency design calculations and simulation of multistage transistor circuits. It also includes trans-linear circuits, the charge-control model and an introduction to operational-amplifier design and application. There are 2 labs and a design problem, all of which require substantial time and effort, especially lab 2. The level of the course is just about right for CME students to learn a lot and gain a lot more lab experience.

Lecturer – J. Roberge
Knowledgeable and approachable but his lecture style was quite random and tended to lack clear goals or continuity with previous lectures.

Lecturer – K. Lundberg
Very passionate and inspired motivation for the course. Excellent course notes too and was able to explain concepts clearly.

Breakdown of Grades

Six p-sets:	10%
Midterm:	15%
Labs and Design Problem:	45%
Final:	30%

Plusses:
- Lots of practical circuit design.
- Class Notes.
- Lundberg.

Minuses:
- Lab 2.

6.302 Feedback Systems (U)

Difficulty: *7.0/10.0*
Lecturer: *J. Roberge*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *IA & IB Control*
Time Commitment: *4-4-5*

Course Overview
You should do this course! It is a great extension of the control systems you learn in the first two years at Cambridge. The subject covers time-domain and frequency-domain performance measures, stability and degree of stability, Nyquist criterion and frequency-domain design. Root locus method, compensation techniques together with applications to a wide variety of physical systems are also covered. Again there is a good depth and level of material covered, making it a good course to take.

Lecturer – J. Roberge
Knowledgeable and approachable but his lecture style was quite random and tended to lack clear goals or continuity with previous lectures.

Breakdown of Grades

P-sets:	10%
2 Quizzes:	25%
Labs:	15%
Design Problem:	15%
Final:	35%

Plusses:
- Practical nature of class.
- Demos.

Minuses:
- Lab equipment.
- Inconsistent grading.

6.334 Power Electronics (H)

Difficulty: *6.0/10.0*
Lecturer: *D. Perreault*
Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Prerequisites: *IA & IB Linear Circuits*
Time Commitment: *3-0-9*

Course Overview

This course covers the basics of power electronics: the application of electronics to energy conversion, including a brief discussion of the control of power electronic systems. Topics include rectifier/inverter circuits, dc-dc converters, high-frequency inverters, characteristics and applications of power electronic devices, modelling and control techniques, and magnetic components and circuits. The course does not explore any individual topic in a lot of depth, but gives a good overview of all aspects of the field. The course also contains very little tedious calculation, and most of the problem sets are short if you understand the principles covered in the lectures. In part, the course overlaps with 3B3, but emphasises power electronic circuit analysis and design, rather than devices. More advanced topics such as resonant converters, resonant pole inverters, current mode control etc. are covered, although they are not examined. Much of the material covered is very practically applicable. If you enjoyed 1B electrical power, this is a great course to take!

Lecturer – D. Perreault

Incredibly knowledgeable, lectures with an authoritative air and always helpful and willing to answer questions, although sometimes he tends to dwell too long on the simpler concepts. Always gives a good, intuitive way of understanding a circuit.

Breakdown of Grades

Ten p-sets:	40%
Quizzes:	50%
Labs and Design Problem:	10%

Plusses:

- Great lectures
- Ice-cream during quizzes
- No final

Minuses:

- The recommended text is terrible, though mandatory since many of the homework problems are set from it.

6.341 Discrete Time Signal Processing (H)

Difficulty: *8.0/10.0*
Lecturer: *Vivek Goyal*
Terms Offered: *Fall (Previously also Spring)*
Term Evaluated: *Spring 2005*
Prerequisites: *6.011, 1B Signal Processing*
Time Commitment: *5-0-12*

Course Overview
An excellent course to take for anyone serious about studying Signal Processing at a higher level, 6.341 covers the most important techniques in the representation, analysis and design of discrete-time signals and systems. The course material overlaps with Cambridge Fourth year signal processing modules 4F6, 4F7, and 4F11, but also includes other interesting and important concepts that are not normally taught at the CUED. The emphasis of the course is on understanding, and the problem sets and quizzes are often theoretically challenging and very worthwhile. A design project during the term explores practical application of concepts and also hones MATLAB skills. Religious reading of the course text is recommended.

Lecturer – V. Goyal
Professor Goyal is very knowledgeable and approachable, however he is a new lecturer who is relatively inexperienced in teaching, and not particularly confident. He speaks clearly and enthusiastically, but his explanations of certain concepts are poor. His lecture slides are mainly copied from the course text.

Breakdown of Grades

Ten p-sets:	15%
Mid-term:	30%
Design Project:	15%
Final:	40%

Plusses:
- Course material is comprehensive and well organised
- Does not involve grunge work

Minuses:
- Time consuming: reading and doing problem sets

Comments:
This course is really great if you are interested in some serious Signal Processing, but requires a good understanding of the concepts covered in 6.011, especially random processes, as well as the DTFT and z-transform. Thus the course is usually taken during the spring (after 6.011 in the fall). MIT announced this year however that 6.341 will only be offered in the Fall in the academic year 2005/2006, so if you want to take it, then a serious amount of independent study may be required. It is worth checking this however.

6.374 Analysis and Design of Digital Integrated Circuits (U)

Difficulty: *9.0/10.0*
Lecturer: *A. Chandrakasan*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *IA & IB Electronics, 6.004, 6.012*
Time Commitment: *3-9-15*

Course Overview
Device and circuit level optimization of digital building blocks, MOS device models including Deep Sub-Micron effects and circuit design styles for logic, arithmetic and sequential blocks. Also covered is interconnects, active clock distributions and memory architectures. The course is very tough and involves a lot of work and is by no means an equivalent of a single Cambridge third year module. The final project is very open-ended and time consuming, as are many of the p-sets, take this course with extreme caution!

Lecturer – A. Chandrakasan
Anantha is well organised and seen as an expert in his field, but is known for his high level of work expected and fast pace during lectures. He will expect a lot for the final project.

Breakdown of Grades

P-sets:	20%
2 Quizzes:	50%
Final project:	30%

Plusses:
- Course content.

Minuses:
- Time commitment.
- Long p-sets and difficult exams.

Comments:
The official prerequisites for the course are 6.004 and 6.012, and it would be worth looking through these beforehand. A detailed understanding of the operation of MOSFETs is essential for the first part of the course, above and beyond what is taught in 1A and 1B.

6.720 Integrated Microelectronic Devices (H)

Difficulty: *8.0/10.0*
Lecturer: *J. A. del Alamo*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *-*
Time Commitment: *4-2-10*

Course Overview
Although 6.012 is listed in the MIT course guide as a prerequisite for this course, many of us would recommend that you take 6.720 instead. 6.720 gives a very detailed understanding of all common electronic devices, starting from the very basics of semiconductors. The emphasis of the course is in developing an intuitive understanding of solid state physics, and combining this with mathematically rigorous techniques to allow the student to analyse a wide variety of semiconductor devices. For a good Cambridge student, there are no prerequisites, although the workload is heavy and the problem sets are sometimes difficult (but all worthwhile). The course text (written by the lecturer) is excellent.

Lecturer – J. A. del Alamo
Knowledgeable, approachable, and authoritative. Lecture notes are well organised and easy to digest, explanations are clear and gives not only mathematical, but also intuitive understanding.

Breakdown of Grades

P-sets:	15%
2 Quizzes:	40%
Device Characterisation projects:	10%
Design Problem:	10%
Final:	25%

Plusses:
- Excellent lectures and course text
- Explores all the most important second order effects in modern microelectronic devices (such as DIBL).

Minuses:
- Heavy work commitment

Course 8 - Physics

8.05 Quantum Physics II (U)

Difficulty: *6.0/10.0*
Lecturer: *I. Stewart*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Time Commitment: *5-0-6*

Comments
Any CME physicist will have met almost all of the material in 8.05 in part IB. The material is covered in more depth and at a higher level so it's worth taking this course.

Lecturer – I. Stewart
It was easy to take useful notes from the lecture but the presentation was sometimes monotonous.

8.06 Quantum Physics III (U)

Difficulty: *7.0/10.0*
Lecturer: *K. Rajagopal*
Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Time Commitment: *5-0-9*

Comments
This is equivalent to the part II Advanced Quantum Physics course. You have to research write a substantial paper during the term. The problem sets are long and tedious.

Lecturer – K. Rajagopal
Lecture presentation was well organized and he was an engaging lecturer. He often rushed through topics and abandoned having a short break in the middle of a 90-minute lecture part way through term.

8.08 Statistical Physics II (U)

Difficulty: *5.0/10.0*
Lecturer: *X. Wen*
Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Time Commitment: *4-0-4*

Comments
There is a lot of material in common with 8.231 Physics of Solids, so it might not be advisable to take both. Much of the course material of part II Statistical and Thermal Physics is covered. It is an easy course with short problem sets and open book exams.

Lecturer – X. Wen
He was difficult to understand and did not write coherent notes on the board.

8.231 Physics of Solids I (U)

Difficulty: *7.0/10.0*
Lecturer: *R. Ashoori*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Time Commitment: *4-0-8*

Comments
About half of the material was familiar and a lot of the material for the equivalent Cambridge course on condensed matter theory was not covered.

Lecturer – R. Ashoori
Often his explanations were confusing but he was very willing to spend time answering questions in lecture. He didn't write enough on the blackboard so it was difficult to get useful notes out of lectures.

8.284 Modern Astrophysics (U)

Difficulty: *7.0/10.0*
Lecturer: *P. Schechter*
Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Time Commitment: *3-0-7*

Comments
This is a good course to take in place of Part II Astrophysics.

Lecturer – P. Schechter
An entertaining lecturer. The lectures were sometimes difficult to follow with lots of algebra and not enough explanation.

8.311 Electromagnetic Theory (H)

Difficulty: *9.0/10.0*
Lecturer: *L. Levitov*
Terms Offered: *Fall*
Term Evaluated: *Spring 2005*
Time Commitment: *4-0-8*

Comments
This course covers the electromagnetic part of the Part II Relativity, Electrodynamics and Light course at a higher level and goes further into the subject. In order to do this course it would be advisable to study 4-D special relativity and some electromagnetism beyond part IB level. There is nothing assumed that's not covered in IB Physics/Advanced Physics, it's just that some parts are skimmed over quickly.

Lecturer – L. Levitov
A very clear lecturer but his presentation tended to be quite dull.

Course 10 – Chemical Engineering

10.213 Chemical and Biological Engineering Thermodynamics (U)

Terms Offered: *Fall & Spring*
Term Evaluated: *Fall 2004*
Time Commitment: *4-0-7*

Comments
Mainly thermodynamics. ChemE from Natural science will probably find it easier than the ones from CUED, I suggest you revise a bit or don't forget your entropy, enthalpy, thermodynamics 1, 2, 3 law.

10.301 Fluid Dynamics (U)

Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Time Commitment: *3-0-8*

Comments
Fluid mechanics, a bit similar to 10.302 but easier. There is a p-set every week so you need to keep on top of things.

10.302 Transport Processes (U)

Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Time Commitment: *4-0-10*

Comments
Famous for its heavy workload and being difficult. It is actually not that horrible, if you organise your time well. The key to doing well in this class is: if you have no idea about the p-set, go and borrow a bible. I am not saying you should copy all of it, at least, you can get the idea from the bible. Bible here means the past papers. There is a ChemE bible room, which requires a password that you can get from the office on the 3rd floor. Everything, apart from the final is pretty similar to the bible, so why don't you take the easier route? However, the final exam requries a lot of understanding, do make sure you read the book carefully. Don't panic, when you hear that you haven't done the pre-requisites for this class, it doesn't matter than much.

10.32 Separation Processes (U)

Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Time Commitment: *3-0-6*

Comments
An extended version of 10.302, but much less work, and generally people find it easier.

10.37 Chemical Kinetics and Reactor Design (U)

Terms Offered: *Spring*
Term Evaluated: *Spring 2005*
Time Commitment: *3-0-10*

Comments
Famous for being hard and a heavy work load as well... As usual, your classmates have done more kinetics than you but don't worry, it will take you about 4-5 hours extra work to catch up with your classmates.

5.07 Biological Chemistry I (U)

Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Time Commitment: *4-0-8*

Comments
70% new stuff. Mainly organic chemistry, the level is much higher than A-level chemistry so for students from CUED: Don't worry too much but do a bit reading if you can. You need to write down 6 sides of cheat sheets for 3 exams, it will save a lot of time if you can borrow someone else's. Ask any Chemistry student or chemical engineering student (70% of them have taken this class already.

General Course 10 Advice

General ideas about the compulsory classes:

1. Don't worry too much if you hear people saying: yes, this class is pretty much a revision class (e.g. 10.213), it is not for you!

2. BORROW the notes from your classmates, (your classmates from 10.302 have definitely taken 10.301 before).

3. Most people find it easier to cope with the workload in spring term.

4. Office hours help, even though you may have had an idea about how to do stuff already.

5. Reading up on physical (Course 5.60 here) and organic chemistry in general may help. Obviously you don't necessarily need to do it - you need to relax and store energy before coming here!

Course 16 – Aeronautics and Astronautics (Aero/Astro)

16.100 Aerodynamics (U)

Difficulty: *3.0/10.0*
Lecturer: *D . Darmofal*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *IA & IB Thermofluidsl*
Time Commitment: *3-3-8*

Course Overview
You should do this course! Covers the basics of fluids and aerodynamics, pretty much required for the third year. The fluids side of things overlap significantly with 2.25, although the latter gives a far more thorough treatment. The aerodynamics side covers more material than the equivalent Cambridge course. Very well taught, and A grade is likely for the average Cambridge student.

Lecturer – D. Darmofal
He is one of the best lecturers at MIT and is very good at explaining things. Take his classes wherever you can!

Breakdown of Grades
10 P-sets:
2 Orals + 2 take homes:
Project

Plusses:
- Clarity of explanations.

Minuses:
- None - take this course!

16.901 Numerical Methods for Aerospace Engineering (U)

Difficulty:	*5.0/10.0*
Lecturer:	*D. Darmofal*
Terms Offered:	*Spring*
Term Evaluated:	*Spring 2005*
Prerequisites:	*IA & IB Thermofluids*
Time Commitment:	*3-3-6*

Course Overview

Covers well the basics/design rationales of finite difference, volume, element methods and the monte carlo statistical method as well. This course makes extensive use of Matlab, but isn't too difficult. The projects are also VERY cool.

Lecturer – D. Darmofal

He is one of the best lecturers at MIT and is very good at explaining things. (see 16.100). Numerical methods is his research area and it's obvious he's brilliant at it, which might explain why his explanations for things were shorter and requires more concentration than usual.

Breakdown of Grades

15 P-sets, only 2/3 is compulsory:
2 Oralswith written parts:
3 Projects

Plusses:

- Clarity of explanations.
- Projects are very practical, useful and cool.

Minuses:

- Requires being comfortable with Matlab or learning Matlab.

16.20 Structural Mechanics (U)

Difficulty: *5.0/10.0*
Lecturer: *B. Wardle*
Terms Offered: *Fall*
Term Evaluated: *Fall 2004*
Prerequisites: *IA & IB Structures*
Time Commitment: *3-3-6*

Course Overview
Basic structures as taught in Cambridge were repeated in a far more mathematically rigorous way. Also further topics including stress field equations, torsion, non-uniform beams, shells, and vibrations were shown. About half the course is new to us, but the whole course is more mathematical.

Lecturer – B. Wardle
The worst lecturer in MIT that we've encountered. Using existing OHP slides passed down from another professor, he makes a very bad job at explaining the topics. Grading and setting of psets and exams were also dubious. If he continues to teach this course, then all by the most enthusiastic structural-aero student should take this course.

Breakdown of Grades
10 P-sets
2 mid-terns
3 group projects
1 Final

Plusses:
- Course content in theory adds to understanding of structures.

Minuses:
- The lectuerer.