Programme Specifications

MANUFACTURING ENGINEERING TRIPOS

1 Awarding body
   University of Cambridge

2 Teaching institution
   Department of Engineering

3 Accreditation details
   IET, IMechE

4 Name of final award
   Bachelor of Arts, Master of Engineering

5 Programme title
   Manufacturing Engineering Tripos

6 UCAS code
   H100 MEng/E

7 JACS code(s)
   H100

8 Relevant QAA benchmark statement(s)
   Engineering

9 Qualifications framework level
   6 (Honours) for Part IIA; 7 (Masters) for Part IIB

10 Date specification produced/last revised
   July 2009

11 Date specification last reviewed
   June 2014

Educational Aims of the Programme

The programme aims to:
- Produce engineering graduates equipped to play leading roles in manufacturing industry, business, the professions and public service.
- Provide graduates with the skills and knowledge to be immediately effective in their industrial careers
- Develop in response to the needs of international manufacturing academic and industrial communities.

Programme Outcomes - the programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas.

Knowledge and understanding

A. Knowledge and understanding of:
(a) Manufacturing processes, microstructure and properties for all classes of materials;
(b) Operation and control of production machines and systems;
(c) Integration of engineering and industrial design in new product creation;
(d) Management of material and information flow in the supply chain;
(e) Design of production flows and operations in manufacturing;
(f) Theory of organisational behaviour;
(g) Managing business and people;
(h) Financial and management accounting;
(i) Industrial economics, strategy and corporate governance;
(j) Contemporary issues in manufacturing
B. Knowledge and understanding in an industrial context of:
(a) Production technologies and materials;
(b) Manufacturing systems engineering;
(c) Technology and innovation management;
(d) People management;
(e) Strategy and marketing;
(f) Enterprise, globalisation and policy;
(g) Sustainable manufacturing.

Teaching/learning methods and strategies:
A is acquired during the first year of the course, through a combination of lectures, small group teaching (supervisions), coursework, a group project, and a programme of industrial visits.

Acquisition of B, during the second year of the course, is through a combination of taught course modules that include lectures from internal and external speakers, project work, visits to industrial companies and industry-based projects.

Assessment:
Testing of the knowledge base in A is through a combination of unseen written examinations and assessed coursework which takes the form of essays, reports, exercises.

Testing of B is partly through unseen written examination, but mainly through assessment of project work and coursework.

Skills and other attributes

A Intellectual (thinking) skills – able to:
1. Analyse and solve engineering problems;
2. Design a system, component or process to meet a need;
3. Be creative in the solution of problems and in the development of designs;
4. Formulate and test hypotheses;
5. Evaluate designs, processes and products, and make improvements;
6. Integrate and evaluate information and data from a variety of sources;
7. Take an holistic approach in solving problems and designing systems, applying professional judgements to balance risks, costs, benefits, safety, reliability, aesthetics and environmental impact.

Teaching/learning methods and strategies
Intellectual skills are developed through the teaching and learning programme outlined above. Analysis and problem solving skills are further developed in the first year through examples papers (question sheets issued by course lecturers), supervisions (small group teaching), and through a group project to produce a conceptual design for a product or service, together with a marketing and business plan.

In the second year the skills are placed in an industrial context with each student undertaking one three-day exercise in a group of eight students; one two-week project in a pair; one four-week project in a team of three or four, and one seven-week individual project. The projects normally take place in industrial premises and require a high level of problem solving ability for success. Deliverables include an oral presentation and a written report. Detailed individual feedback is given to students on all aspects. Students also undertake a university-based automation and robotics project.
Assessment.
Analysis and problem solving skills are assessed through a combination of unseen written examinations, coursework reports and project deliverables, in which the criteria include the quality of analysis that has gone into the project solution.

B Practical skills – able to:
1. Analyse experimental results and determine their strength and validity;
2. Prepare technical reports;
3. Give technical presentations;
4. Model and test solutions to problems;
5. Use computational tools and packages;
6. Carry out data gathering & analysis;
7. Use incomplete data in decision making;
8. Balance theory and observed practice.

Teaching/learning methods and strategies
Training in skills 1-7 is initiated in the first year, through lectures, supervisions, workshops and seminars, and coursework. These skills and skill 8 are further developed in the second year in the industrial projects and taught modules.

Assessment
Coursework in the form of essays and reports (1,2,4,5,6,7), project work presentations and reports (1,2,3,4,5,6,7,8). The second year project assessments include criteria for oral and written presentation and report writing as well as the gathering and use of data in drawing conclusions.

C Transferable skills – able to:
1. Communicate effectively (in writing, verbally and through drawings);
2. Work as a member of an interdisciplinary team;
3. Use Information and Communications Technology;
4. Manage resources and time;
5. Learn independently in familiar and unfamiliar situations;
6. Solve Problems;
7. Sell Ideas;
8. Network.

Teaching/learning methods and strategies
Transferable skills are developed through the teaching and learning programme outlined above.

Skill 1 is initially taught through a workshop session as part of the induction programme, and is developed through a variety of reports and presentations made following industrial visits and as part of coursework assignments and projects. Skill 2 is developed through workshops and project work throughout the course.

Skills 3-8 are introduced in workshop sessions in the first year and developed during the project work in both years of the course.

Assessment
Skill 1 is assessed through coursework exercises and reports, presentations and oral examinations. The other skills are assessed inherently in the project work.
Programme structures and features, curriculum units (modules), credit and award requirements

The programme is only offered as a full-time course, which normally lasts for two years and leads at the end of the final year to the degrees B.A. (with honours) and MEng. It is possible for a student to leave after one year with a BA Honours degree. However, the course is designed around a two-year structure and the student would be leaving his or her training unfinished. The normal entry route is through two years of Engineering (Part IA and Part IB), but students who have completed Part I Chemical Engineering are also eligible. Students from other part 1 courses might also be considered in exceptional circumstances. Students are selected for the course on the basis of a reference, interview and academic record. Qualities which are sought include enthusiasm, motivation, communication skills, organisational ability, team-working, interpersonal skills, and ability to work under pressure.

Year 3
MET IIa       BA (Hons)
(First year of Manufacturing Engineering)

Progression requirements
Minimum of II.2 class performance across aggregate of papers and coursework, or III class performance if II.2 class performance was achieved in year 2.

Induction programme: The first three days of the course consist of lectures, practical sessions and workshops providing a framework for academic and professional development aspects of the course. The students are encouraged to get to know each other and form a cohesive group. During the first two terms, students study 8 modules, each of 16 lectures:

3P1: Materials into products (common with Paper 3C1 in the Engineering Tripos Part IIA);
3P2: Operation and control of production machines and processes;
3P4: Operations management;
3P5: Industrial engineering;
3P6: Organisational behaviour;
3P7: Managing business and people;
3P8: Financial and management accounting;
3P9: Industrial economics, strategy and governance.

Lectures are supplemented by individual study focused on examples papers or essay assignments depending on the nature of the course. About three supervisions (small-group teaching) are typically provided for each module.

In addition there are two modules of equal weight with the others but with different structures.

3P3: Product design, is a studio-based course, assessed by submission of a portfolio of work for two pieces of coursework.
3P10: Contemporary issues in manufacturing combines two four-lecture courses on topical manufacturing sectors with a set of industrial visits. During the first two terms, students visit six firms from a range of sectors. Each visit is followed by a debrief session, in which the presentations are assessed. Attendance on visits is mandatory, and also contributes towards assessment. One day a week during the first two terms is devoted to the visit and debrief sessions, in addition to a range of professional and personal development skills.
There are three elements of coursework: the Major Project, a Production Game, and a CAD/CAM exercise. The Major Project runs from the end of the first term through the first part of the second term (up to one day a week), and for four weeks full-time in the third term. Students in groups of three or four identify an opportunity for a new product, consider possible design solutions and develop these concepts into prototypes. In addition, they prepare a business plan outlining routes to exploiting the product. The project is formally assessed at three or more stages, and is closely mentored throughout by a team consisting of internal staff. Additional input is sometimes provided by industrial consultants and bankers. Assessments take the form of oral presentations, written reports, a business plan, design portfolios and an end of project design show.

**Year 4**
**MET IIb (Second year of Manufacturing Engineering)**

**MEng**
Requires a minimum of II.2 class performance in the total mark for coursework and projects, as well as a minimum of II.2 level performance in the written examinations.

The course consists of intensive Cambridge-based modules and periods in industry, on projects or on company visits. Modules run for between three days and two weeks. Teaching takes the form of lectures delivered by academics and supplemented by material delivered by industrial speakers. Taught material is reinforced with project work, self-study assignments (often in groups) and industrial visits.

Modules cover:
- Enterprise, globalisation and policy;
- Production technologies and materials;
- Manufacturing systems engineering;
- Sustainable manufacturing.
- Industrial systems, operations & services;
- Managing people;
- Technology and innovation management;
- Strategy and marketing;

During the first term, students in teams of up to ten complete a robotic assembly project. This is closely associated with the manufacturing systems engineering module.

Projects activities:

- Induction project: Early in the course, students in groups of about eight take part in an Induction Project in a company, mapping the flows of materials and information. The project teaches them how to gather and process information in a company, and how to generate and present a coherent picture, both as an oral presentation and as a written report. The project lasts three days, and students will be away from Cambridge during this project.
- 2 week project: in the first term, students in pairs (where possible) work in a company for a period of two weeks to solve a real problem. A staff member oversees the project and has regular contact with the students, and they have a supervisor in the company, but they are expected to be self-sufficient to a high degree. Students will be away from Cambridge Monday-Friday during this project.
- 4 week project: similar to the 2 week project, but students are in groups of about 4 and the project runs over 2 x 2 week periods in the second term. Students will be away from Cambridge Monday-Friday during this project.
• Individual long project: The final project is a seven-week individual project, which may be based in industry in UK or abroad, or may take the form of academic research relating to a manufacturing topic.

On completion of the taught elements of the course, students may undertake an overseas study tour, which is organised by the students. This does not count towards the degree.

PLEASE NOTE. This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course and module can be found on-line at [http://www.ifm.eng.cam.ac.uk/met/](http://www.ifm.eng.cam.ac.uk/met/) The accuracy of the information contained in this document is reviewed by the University and may be checked by the Quality Assurance Agency. It is, however, natural for courses to develop and change over time and we reserve the right, without notice, to withdraw, update or amend this programme specification at any time.

Every effort has been made to ensure the accuracy of the information in this programme specification. At the time of publication, the programme specification has been approved by the relevant Faculty Board (or equivalent). Programme specifications are reviewed annually, however, during the course of the academical year, any approved changes to the programme will be communicated to enrolled students through email notification or publication in the Reporter. The relevant faculty or department will endeavour to update the programme specification accordingly, and prior to the start of the next academical year.

Further information about specifications and an archive of programme specifications for all awards of the University is available online at: [www.admin.cam.ac.uk/univ/camdata/archive.html](http://www.admin.cam.ac.uk/univ/camdata/archive.html)