PROGRAMME SPECIFICATIONS

Awarding body/institution	Glyndŵr University
Teaching institution (if different from above)	N/A
Details of accreditation by a professional, statutory or regulatory body (including link to relevant website)	IET (Institution of Engineering and Technology) accreditation to be sought for: • MEng in Performance Car Technology; • BEng (Hons) in Performance Car Technology. http://www.theiet.org/ IMechE (Institution of Mechanical Engineers) accreditation to be sought for: • MEng in Aeronautical and Mechanical Engineering; • BEng (Hons) in Aeronautical and Mechanical Engineering; • BEng (Hons) in Aeronautical and Mechanical Manufacturing; • MEng in Performance Car Technology; • BEng (Hons) in Performance Car Technology. http://www.imeche.org/Home RAeS (Royal Aeronautical Society) accreditation to be sought for: • MEng in Aeronautical and Mechanical Engineering; • BEng (Hons) in Aeronautical and Mechanical Engineering; • BEng(Hons) in Aeronautical and Mechanical Manufacturing. http://aerosociety.com/
What type of accreditation do these programmes lead to?	The following programmes, i.e.: • MEng in Aeronautical and Mechanical Engineering; • MEng in Performance Car Technology. fully satisfy the education requirements for CEng (Chartered Engineer) registration. The following programmes, i.e.: • BEng(Hons) in Aeronautical and Mechanical Engineering; • BEng(Hons) in Aeronautical and Mechanical Manufacturing; • BEng(Hons) in Performance Car Technology. partially satisfy the education requirements for CEng (Chartered Engineer) registration. Further learning at Masters level is required.
Is accreditation in some way dependent on choices made by students?	No
Final award/s available eg BSc/DipHe/CertHE	a) MEng in Aeronautical and Mechanical Engineering b) BEng (Hons) in Aeronautical and Mechanical Engineering c) BEng in Aeronautical and Mechanical Engineering

	d) Diploma of Higher Education in Aeronautical and Mechanical Engineering e) BEng (Hons) in Aeronautical and Mechanical Manufacturing f) BEng in Aeronautical and Mechanical Manufacturing g) Diploma of Higher Education in Aeronautical and Mechanical Manufacturing h) MEng in Performance Car Technology i) BEng (Hons) in Performance Car Technology j) BEng in Performance Car Technology k) Diploma of Higher Education in Performance Car Technology l) BSc (Hons) in Motorsport Design and Management (Top up Level 6) m) Certificate of Higher Education in Engineering n) Glyndŵr University Certificate of Continuing Education (Engineering) (awarded with a minimum of 40 credits)
Award title	**1) MEng in Aeronautical and Mechanical Engineering** **2) BEng (Hons) in Aeronautical and Mechanical Engineering** **3) BEng (Hons) in Aeronautical and Mechanical Manufacturing** **4) BSc (Hons) in Motorsport Design and Management (Top up Level 6)** **5) MEng in in Performance Car Technology** **6) BEng (Hons) in Performance Car Technology**
JACS 2 code	**1) H410: Aeronautical Eng / H300: Mechanical Eng.** **2) H410: Aeronautical Eng / H300: Mechanical Eng.** **3) H410: Aeronautical Eng / H300: Mechanical Eng.** **4) H330: Automotive Eng.** **5) H330: Automotive Eng.** **6) H330: Automotive Eng.**
UCAS code (to be completed by admissions)	MEng AME HH41 BEng AME HH34 BEng AMM BEng MDM H33A MEng PCT H33B BEng PCT H431
Relevant QAA subject benchmark statement/s	QAA subject benchmark statements – Engineering (Nov - 2010) QAA subject benchmark statement: Engineering – Annex B4, MEng degrees (Jan - 2010) QAA Code of Practice for the Assurance of Academic Quality and Standards in HE - Section 9: Work-based and placement learning (2007)

Other external and internal reference points used to inform the programme outcomes	UK Standard for Professional Engineering Competence (UK SPEC) – Engineering Council UK
Modes of study *(p/t, f/t, distance learning)*	**1)** MEng in Aeronautical and Mechanical Engineering – **Full time** **2)** BEng (Hons) in Aeronautical and Mechanical Engineering – **Full time and Part time** **3)** BEng (Hons) in Aeronautical and Mechanical Manufacturing – **Full time and Part time** **4)** BSc (Hons) in Motorsport Design and Management (Top up Level 6) – **Full time** **5)** MEng in Performance Car Technology – **Full time** **6)** BEng (Hons) in Performance Car Technology – **Full time and Part time**
Language of study	English
Date at which the programme specification was written or revised	September 2012 Updated October 2013 Updated November 2015

Criteria for admission to the programmes

The Engineering department welcomes applications from all backgrounds: school or college leavers; people in industry whether employment is relevant or not; European and international students. The aim of the admissions policy is to enable maximum participation from all who are capable of benefiting from a programme of study.

Entry to Level 4

BEng (Hons)

The normal entry requirements for Level 4 are 240 UCAS tariff points at GCE A Level or equivalent for BEng (Hons) programmes (To include normally GCE A level in mathematics/physics or equivalent). These could be achieved by combining points from different qualifications so long as they are not in the same subject: Two GCE A Levels at grades AA/A*B or three GCE A Levels at grades CCC/BCD/BBE, etc or Scottish Highers (Two advanced Highers at grades AB or one Advanced Higher at grade A plus two Highers at grades BC worth 245 points, etc).

Each BEng(Hons) Level 4 application will be considered individually, taking into account different qualifications including Irish Leaving Certificates, International Baccalaureate, Welsh Baccalaureate, Access Courses, BTEC Nationals (One BTEC Extended Diploma Level 3 at grades MMM, etc), GNVQ, NVQ and VRQ as well as other qualifications from overseas.

MEng

The normal entry requirements for Level 4 are 280 UCAS tariff points from GCE A Level or equivalent (To normally include GCE A level in mathematics/physics or equivalent) with a minimum of 200 points from 2 GCE A-Levels or equivalent for MEng programmes.

Each MEng Level 4 application will be considered individually, taking into account different qualifications including Irish Leaving Certificates, International Baccalaureate, Welsh Baccalaureate

(Welsh Baccalaureate Advanced Diploma is welcomed alongside A-Levels or equivalent, to meet the overall course UCAS tariff requirements), Access Courses, BTEC Nationals (One BTEC Extended Diploma Level 3 at grades DMM or one BTEC Diploma Level 3 at grades DM in addition to an A-Level Grade C in a relevant subject to achieve the overall tariff, etc) as well as other qualifications from overseas.

Applications are welcomed from persons who do not possess the standard qualifications but who can demonstrate, through the presentation of a professional portfolio, their capacity to pursue the programme successfully. A significant aspect of selection is the level of commitment, enthusiasm and interest in the subject as well as the requisite key and cognitive skills.

Entry to Level 5

MEng/BEng (Hons)

For entry to Level 5 of MEng/BEng(Hons) programmes applicants must satisfy the entry criteria and Admissions Tutors by producing documentary evidence that they have achieved a qualification at Level 4 or better in a relevant discipline and submit an AP(E)L claim in line with the University's procedures. Direct entry to Level 5 is subject to the AP(E)L claim being approved.

Entry to Level 5 may be gained by students who can present evidence listed below:

(a) Have passed a Cert HE in a relevant discipline;
(b) Have passed an HNC/HND (to include a Merit in Mathematics) in a relevant discipline;
(c) Have passed a French DUT or BTS in a relevant discipline;
(d) Have passed a qualification from an EU or other overseas country equivalent, as defined as equivalent by NARIC, to a Cert HE or better in a relevant discipline.

Other relevant qualifications or a combination of relevant qualifications and industrial experience may be considered for direct entry to Level 5 in accordance with the University's AP(E)L procedures. The Admissions Tutors can advise.

Entry to Level 6

MEng/BEng (Hons)

For entry to Level 6 of BEng(Hons) programmes applicants must satisfy the entry criteria and the Admissions Tutors by producing documentary evidence that they have achieved a qualification at Level 5 or better in a relevant discipline and submit an AP(E)L claim, in line with the University's procedures. Direct entry to Level 6 is subject to approval of the AP(E)L claim. Entry to Level 6 may be gained by students who can present evidence listed below:

(a) Have passed a Dip HE in a relevant discipline;
(b) Have passed a French DUT with overall average across the two years of 14/20 (i.e.: 70% or better) for MEng programmes or with overall average across the two years of 12/20 (i.e.: 60%) for BEng(Hons) programmes;
(c) Have achieved a minimum of 150 ECTS credits in a relevant discipline (Only 120 ECTS credits equivalent to 240 UK credits will be counted for AP(E)L claims);
(d) Have passed a Foundation Degree or HND in a cognate discipline;

Holders of relevant HND and Foundation Degrees will be considered for entry to Level 6 of MEng programmes if overall modules average is at least 70% or higher or BEng(Hons) programmes if overall modules average is at least 60% or higher. Each application will be considered on their own

merit with the content / outcomes of the completed programme mapped against Level 4 and 5 of the BEng(Hons) programmes and Glyndŵr University AP(E)L procedures will apply. Direct entry to Level 6 is subject to approval of the AP(E)L claim. Where modules are not sufficiently matched, the applicants may be required to pass a bridging programme of study (Normally a Summer School programme) prior to commencing Level 6 modules.

Students who have graduated with an FdEng in Aeronautical Mechanical Manufacturing at Glyndŵr University and have successfully passed the bridging module ENG566 Mechanical Engineering Principles may gain (subject to University approval, in line with the AP(E)L procedures) advanced standing for Level 6 BEng(Hons) Aeronautical and Mechanical Manufacturing or Level 6 Aeronautical and Mechanical Engineering programmes.

(e) Have passed a relevant qualification from an EU or other overseas country equivalent, as defined as equivalent NARIC, to a Dip HE or better in a relevant discipline.

Other relevant qualifications or a combination of relevant qualifications and industrial experience may be considered for direct entry to Level 6 in accordance with the University's AP(E)L procedures. The Admissions Tutors can advise.

European Students wishing to study for an Ordinary degree may seek direct entry, via an AP(E)L claim, for the final year if they have satisfied the following entry requirements:

(a) Have passed a French DUT or BTS in a relevant discipline
(b) Have achieved a minimum of 120 ECTS credits in a relevant discipline (e.g.: German State Certified Engineering Certificate). Note: only 90 ECTS credits equivalent to 180 UK credits will be counted for AP(E)L claims.

Again, this will be dealt with current Glyndŵr University AP(E)L regulations.

Entry to BSc (Hons) Motorsport Design and Management (Level 6 top-up)
For entry to BSc (Hons) Motorsport Design and Management (Level 6 top-up), applicants must satisfy the entry criteria and Admissions Tutors by producing documentary evidence that they have achieved a qualification at Level 5 or better in a relevant discipline. Entry to the programme may be gained by students who can present evidence listed below:

(a) Have passed a Dip HE in a relevant discipline;
(b) Have passed a French DUT;
(c) Have achieved a minimum of 120 ECTS credits in a relevant discipline;
(d) Have passed a Foundation Degree or HND in a cognate discipline;
(e) Have passed a qualification from an EU or other overseas country equivalent, as defined as equivalent NARIC, to a DipHE or better in a relevant discipline.

Other relevant qualifications or a combination of relevant qualifications and industrial experience may be considered for entry onto BSc (Hons) Motorsport Design and Management (Level 6 top-up). Admissions Tutors can advise.

English Language
In addition to technical qualifications, all applicants must be proficient in the use of the English language. European and International candidates must possess a suitable English language

qualification in line with Glyndŵr University's English admission requirements. An overall IELTS score of 6.0, with a minimum of 5.5 in each domain, or equivalent is required.

Home students will normally be expected to possess a suitable GCSE/GCE O level in English (or Welsh, if an applicant's first language is Welsh) at grade C or an approved equivalent qualification.

Transferability
All candidates who apply for the BEng (Hons) programmes initially but who demonstrate reasonable academic performance at the end of Level 5 (Overall aggregate of 55% or above at Level 5) have the opportunity to transfer to the MEng programmes or to continue with the BEng(Hons) programmes. An interview will be offered by the Programme Leader and the Admissions Tutor in order to provide guidance and support with regards to progression and placement. Please note that a successful interview itself is not a progression requirement.

MEng candidates may also request to transfer to the corresponding BEng programme, noting that if this takes place after completion of Level 6 they will be required to undertake additional Level 6 modules to satisfy the BEng module requirements (please refer to the programme structures). The programme team will offer guidance and support to students in these instances.

University's equal opportunities
Selection to join the programmes will be in accordance with the University's equal opportunities policy and with the programme's Admission and Recruitment policy. The criteria for selection is based upon:

(a). Academic ability (application form);
(b). Communication skills (verbal and written), and;
(c). Ability to cope with both the academic and emotional demands of the programmes.

Aims of the programmes

Aims of MEng/BEng Aeronautical and Mechanical Engineering

The programmes aim to produce graduates with knowledge, understanding and skills of aeronautical and mechanical engineering-based subjects and their applications in aeronautical and mechanical industries, and to provide the breadth and depth of learning, skills and attitudes for graduates to meet the future needs of a rapidly changing technology and business environment. The graduates will be equipped with analytical, computational, design and transferable skills, and including an awareness of social and environmental implications, will be able to play leading professional roles in aeronautical and mechanical engineering and related industries, to show initiative, to take responsibility and to make decisions in complex and unpredictable situations.

Aims of MEng/BEng Performance Car Technology

The programmes aim to produce graduates with knowledge, understanding and skills of performance car-related subjects, to explore fully the engineering, design and development of modern racing and performance cars, and to provide students a full understanding of the structures, electronics, dynamics and design of a car, combined with the opportunity to develop relevant business skills. The graduates will be equipped with analytical, computational, design and transferable skills, and including an awareness of social and environmental implications, will be able to play leading

professional roles in performance car and related industries, to show initiative, to take responsibility and to make decisions in complex and unpredictable situations.

Aims of BSc (Hons) Motorsport Design and Management

The programme aims to produce graduates with knowledge, understanding and skills of designing fast road track cars and motorcycles, with a focus on project and business management skills. There is less emphasis on traditional engineering. However, the graduates will be equipped with analytical design and transferable skills, and including an awareness of social and environmental implications, will be able to play leading professional roles in motorsport and related industries, to show initiative, to take responsibility and to make decisions in complex and unpredictable situations.

Distinctive features of the programmes

Benefits studying the programmes:

The programmes have been designed to meet the needs of local, national, and global industries and to develop candidates with knowledge, understanding and skills of Engineering-based disciplines and their applications.

From studying these programmes learners will be able to achieve a number of advanced skills in relation to communication, design and creativity, team work, numeracy, organisational and a variety of workshop skills. They will develop an understanding of the concept and process of engineering design and will apply engineering knowledge to creating and producing designs both as an individual and as part of a team. This ensures that this area of study is varied and on graduation offers excellent, wide-ranging career opportunities. Learners will also have opportunities to acquire business skills.

Career opportunities are wide ranging and the present shortage of practising engineers in the fields of aeronautical, automotive, mechanical, and manufacturing engineering should lead to an increased demand from industry in future years. Students on these programmes in the past have been successful in seeking employment as engineering personnel with renown organisations such as Airbus, British Airways, Jaguar Cars Ltd, J C Bamford Excavators Limited (JCB), Kellogg's Co. of Great Britain Ltd, Kronospan Ltd, Rolls Royce plc, Siemens, Toyota Motor Manufacturing Ltd, to name a few.

Graduate employment rate is amongst the best in the country: 95% of our Aeronautical/Mechanical and Automotive Engineering graduates found employment, or went on to further study, within six months of graduating (HESA Destination of Graduates Leavers Survey 2011).

Benefits of studying the programmes include:

- Computer-aided design laboratories, aircraft hangar with jet and piston aircraft and fully functioning navigation systems, automotive laboratory, mechanical and thermofluid laboratories.
- High level of practical and design contents, which are supported by state-of-the-art equipment including a six-axis flight simulator, an industry-standard rapid prototyping machine (fused deposition method), a subsonic and supersonic wind tunnel, a gas turbine test cell, a 3D scanner, complete temperature process training system.

- Use of industry-standard design and modelling software such as Mathcad, Fluent, ProEngineer, Abaqus, Edge-Cam, Flowcode, MATLAB/Simulink and its toolboxes, Allen Bradley and Siemens PLC software.
- Jaguar and Toyota motor vehicles which provide access to automotive diagnostics.
- Strong links with local, regional, and national businesses. For our students, this means programmes designed to meet the needs of industry and the market place, and greater choice and quality of industrial placement (MEng). Opportunities to visit local and regional companies to gain invaluable work experience in the engineering industry.
- Access to Glyndŵr University's internationally recognised research Centres: e.g.: the Advanced Composite Training and Development Centre based in Broughton.
- Our programmes and research are aimed at developing the expertise, knowledge, and new ideas and cover the full breadth of aeronautical, automotive, and mechanical engineering.
- Emphasis on career development, transferable skills, and professional business management.
- Opportunity for our students to participate in design competitions including the Formula Competition Challenge – A unique experience bringing together a team of specialists in all engineering disciplines.

Graduates who wish to pursue in some depth an area of academic interest within the Engineering department could read for an MPhil or PhD postgraduate degree.

Professional Accreditation is a requirement for most Engineering careers. Graduates complete a period of approved employment and further professional development [matching section for BEng (Hons) graduates only] and after a period of four years and depending on which body they join they may have to pass a test of professional competence through an interview in order to achieve Chartered status, C.Eng.

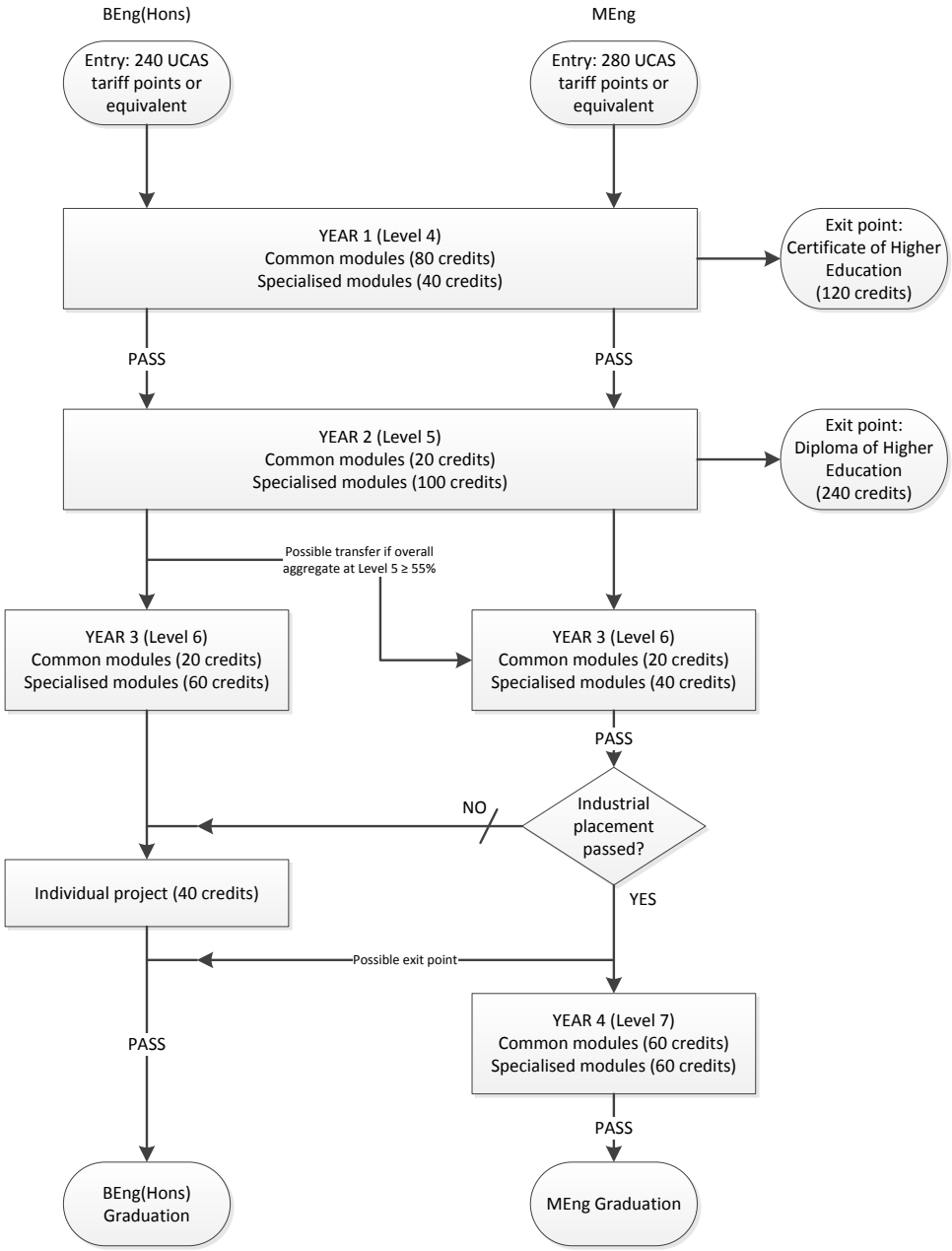
These programmes will be submitted for accreditation by the Institution of Engineering and Technology (IET), the Institution of Mechanical Engineers (IMechE), and the Royal Aeronautical Society (RAeS) via the Engineering Accreditation Board (EAB). The Accreditation visit has already been arranged to take place on 15th-16th May 2013.

Programme Team members are appropriately professionally qualified with relevant prior professional experience and maintain a substantial base of scholarly activity within their professional bodies and related Sector Skills Councils underpinned by academic research.

Programme structures and requirements, levels, modules, credits and awards

The tables below present the programme structures, levels, modules, credits and awards, for:

MEng AM – MEng in Aeronautical and Mechanical Engineering
BEng AM – BEng (Hons) in Aeronautical and Mechanical Engineering
BEng AMM – BEng (Hons) in Aeronautical Mechanical Manufacturing
BEng Ord AM – BEng (Ord) in Aeronautical and Mechanical Engineering
MEng PCT – MEng in Performance Car Technology
BEng PCT – BEng (Hons) in Performance Car Technology
BSc MDM – BSc (Hons) in Motorsport Design and Management



Level 4 (Year 1)

Code	Title	Credits	MEng AM	BEng AM	BEng Ord AM	BEng AMM	MEng PCT	BEng PCT	BSc MDM	Module Leader
ENG458	Mechanical Science	20cr	c	c		c	c	c		
ENG459	Electrical Science	20cr	c	c		c	c	c		RH
ENG460	Laboratory Methods and Materials	20cr	c	c		c	c	c		RJG
ENG461	Engineering Mathematics	20cr	c	c		c	c	c		CB
ENG462	Introduction to Engineering Design and Practice	20cr	c	c		c	c	c		FRW
ENG463	Aircraft Systems	20cr	o	o		o				FRW
ENG464	Mechanical Systems	20cr	o	o		o				ZC
ENG465	Performance Car Systems	20cr					c	c		OD

c = core o = option

Level 5 (Year 2)

Code	Title	Credits	MEng AM	BEng AM	BEng Ord AM	BEng AMM	MEng PCT	BEng PCT	BSc MDM	Module Leader
ENG536	Business and Research Development	20cr	c	c		c	c	c		XY
ENG538	Thermo-fluid and Propulsion	20cr	c	c						XH
ENG547	Avionics, Flight Dynamics and Control	20cr	o	o						ZZ
ENG537	Further Engineering Mathematics	20cr	c	c			c	c		CB
ENG551	Engineering and Mechanism Dynamics and Engineering Design	20cr	c	c		c	c	c		ZC
ENG590	Engineering Design and Analytical Techniques	20cr			c					ZC
ENG552	Structures, Failure Analysis and FEA	20cr	c	c	c	c	c	c		RJG
ENG553	Computer-based Manufacturing and Manufacturing Quality Assurance	20cr				c				SB
ENG554	Production and Manufacturing Strategy	20cr				c				SB
ENG555	Instrumentation and Control Systems Engineering	20cr	o	o	c	c				zc
ENG556	Internal Combustion Engine: Theory and Technology	20cr					c	c		OD
ENG557	Automotive Design	20cr					c	c		OD

c = core o = option

Level 6 (Year 3)

Code	Title	Credits	MEng AM	BEng AM	BEng Ord AM	BEng AMM	MEng PCT	BEng PCT	BSc MDM	Module Leader
ENG603	Inter-Professional Studies in Engineering	20cr		c		c		c	c	AO
ENG615	Flight Stability, Control and Compressible Aerodynamics	20cr	o	o						ZZ
ENG616	Advanced Thermo-fluid and Turbomachinery	20cr	o	o						KD
ENG609	Individual Project (Honours)	40cr		c	c*	c		c	c	RJG
ENG610	Individual Project (Ordinary)	20cr			c*					RJG
ENG611	Industrial Placement	60cr	c				c			RD
ENG619	Aerodynamics and CFD	20cr	c	c	c*		c	c	c	XH
ENG620	Vibration Analysis and Complex Structures	20cr	c	c	c	c	c	c		ZC
ENG621	Modern Aircraft Materials and Technologies	20cr				c				FI
ENG630	Manufacturing Systems Economics and CIM	20cr				c				SB
ENG631	Performance Car Chassis, Engines and Powertrains	20cr					c	c	c	OD
ENG634	Motorsport Group Project	20cr							c	OD

c = core o = option

Level 7 (Year 4)

Code	Title	Credits	MEng AM	BEng AM	BEng Ord AM	BEng AMM	MEng PCT	BEng PCT	BSc MDM	Module Leader
ENG715	Employability and Entrepreneurship	20cr	c				c			CB
ENG717	Advanced Engineering Design and Analysis	20cr	c				c			ZC
ENG716	Group Design Project	40cr	c				c			RG
ENG718	Advanced Performance Car Dynamics and Control	20cr					c			ZZ
ENGM72	Structures and Numerical Analysis	20cr	o							RJG

ENGM63	Applied Aerodynamics	20cr	o							ZZ
ENGM68	Viscous Flow and Heat Transfer	20cr	o							XY
ENG742	Advanced and Composite Materials	20cr	o				o			RD
ENGM70	Advanced Production and Assembly	20cr	o				o			ZC

c = core o = option

Note: * - Individual Project is a compulsory module for BEng (Ord) Aeronautical and Mechanical Engineering. Normally, students will do 20-credit Individual Project (Ordinary) and 20-credit Aerodynamics and CFD. However, an optional selection is to do a 40-credit Individual Project (Honours).

Requirements for the satisfaction of each award, including exit awards

In the proposed programme structures, distinction is made between the five qualifications of Certificates of Higher Education, Diploma of Higher Education, BEng Ordinary Degree (which requires 60 credits at level 6), BEng Honours Degree, and MEng Degree. This is illustrated in the table below:

Qualifications in this proposal	**Academic Level** *FHEQ*	**Credits Attained**	**Professional Status associated with the level****	**Corresponding FQ-EHEA Cycle**
Certificate of Higher Education in Engineering	Level 4	**120** Any 120 Level 4 or higher	N/A	N/A
Diploma of Higher Education	Level 5	**240** 120 from Level 4 or higher 120 from Level 5 or higher	Incorporated Engineer (IEng) plus further learning to Degree level	Short cycle qualification
Ordinary Degree*****	Level 6	**300** 120 at Level 4 100 (minimum) at Level 5 60 (minimum) at Level 6	Incorporated Engineer (IEng)	First cycle qualification
Honours Degree	Level 6	**360** 120 at Level 4 120 at Level 5 120 at Level 6	Chartered Engineer (CEng) plus further learning to Master's level	
Integrated Master's Degree***	Level 7	**480** 120 at Level 4 120 at Level 5 120 at Level 6 120 at Level 7	Chartered Engineer (CEng)	Second cycle qualification

****** *BEng Ordinary: Achievement of 300 credits of which a minimum of 60 and maximum of 80 should be at level 6, a maximum of 120 credits at level 4 and the remainder from level 5.*

******** *Students with the relevant academic credits and vocational/professional experience are encouraged to apply to Professional Bodies for those levels of membership. The consistent successful student application from existing programmes is a source of confidence for the Programme Team.*

**** The Integrated Master's degree programme includes study equivalent to four full-time academic years, of which study equivalent to one full-time academic year is at Level 7. Thus study at Bachelor's level is integrated with study at Master's level and the programme has been designed to meet the Levels 6 and 7 qualification descriptors in full.*

The BEng ordinary degree provides, at a professional level, the academic entry requirements to meet the Engineering Council definition of an Incorporated Engineer (IEng).

There are no specific modules defined for the exit awards of Certificate and Diploma in order to allow maximum flexibility for the student to complete. The only constraint is that for the Diploma of Higher Education where the modules must be part of the programme being studied.

The full-time delivery arrangements/structures are shown in **Figure 1** overleaf.

MEng(Hons) in Aeronautical & Mechanical Engineering

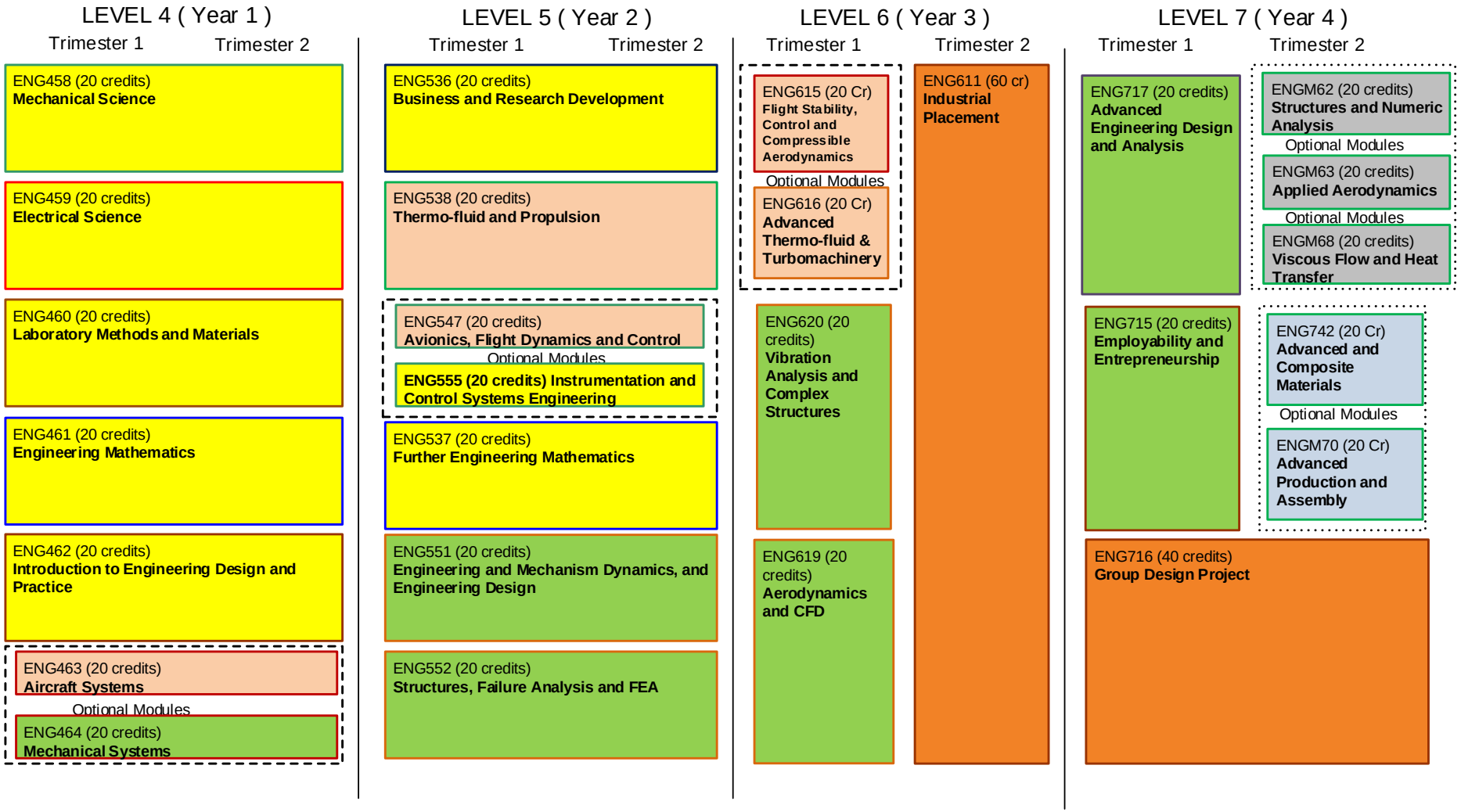


Figure 1 (a)

BEng(Hons) in Aeronautical & Mechanical Engineering

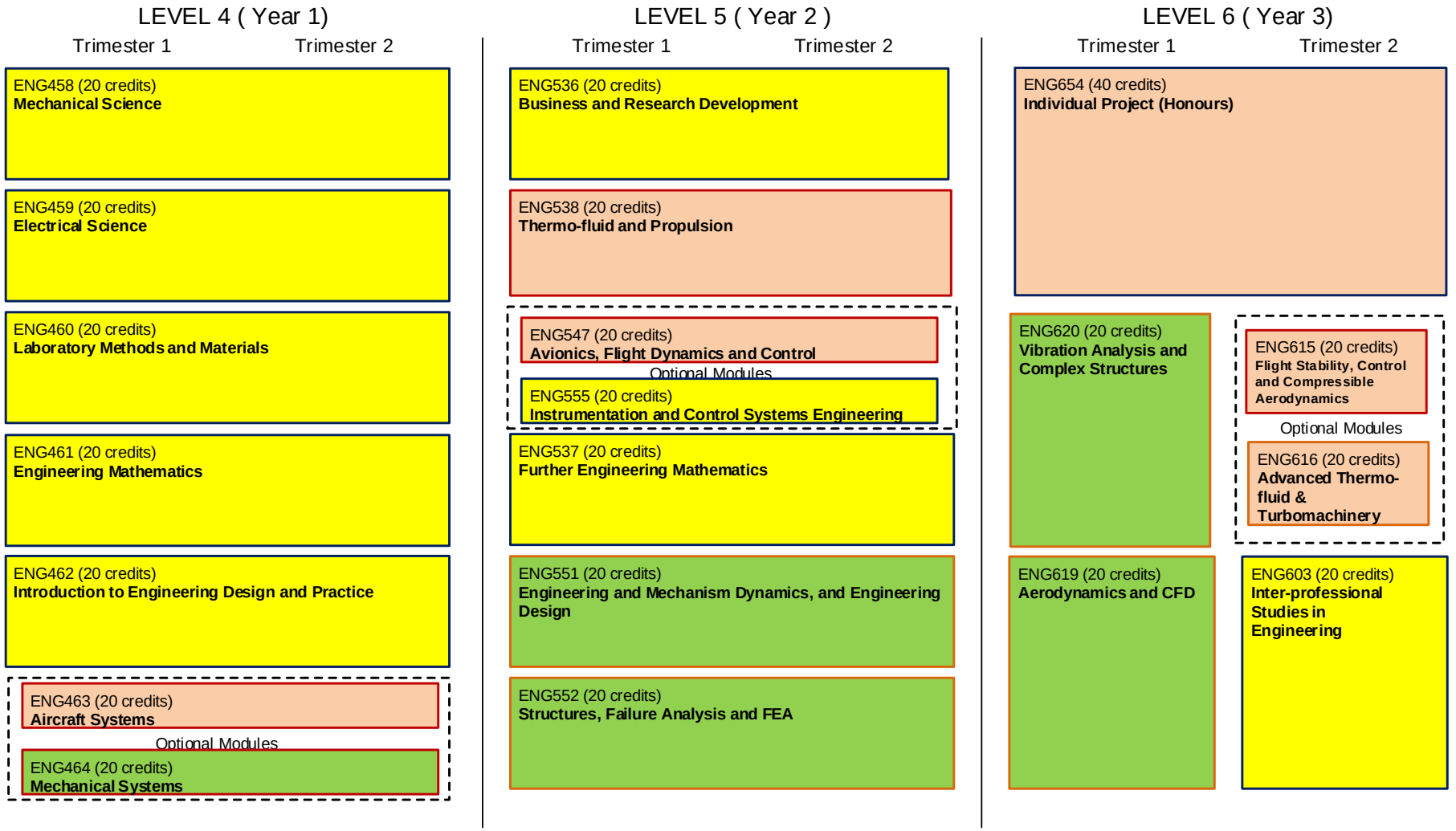


Figure 1 (b)

BEng(Hons) in Aeronautical & Mechanical Manufacturing

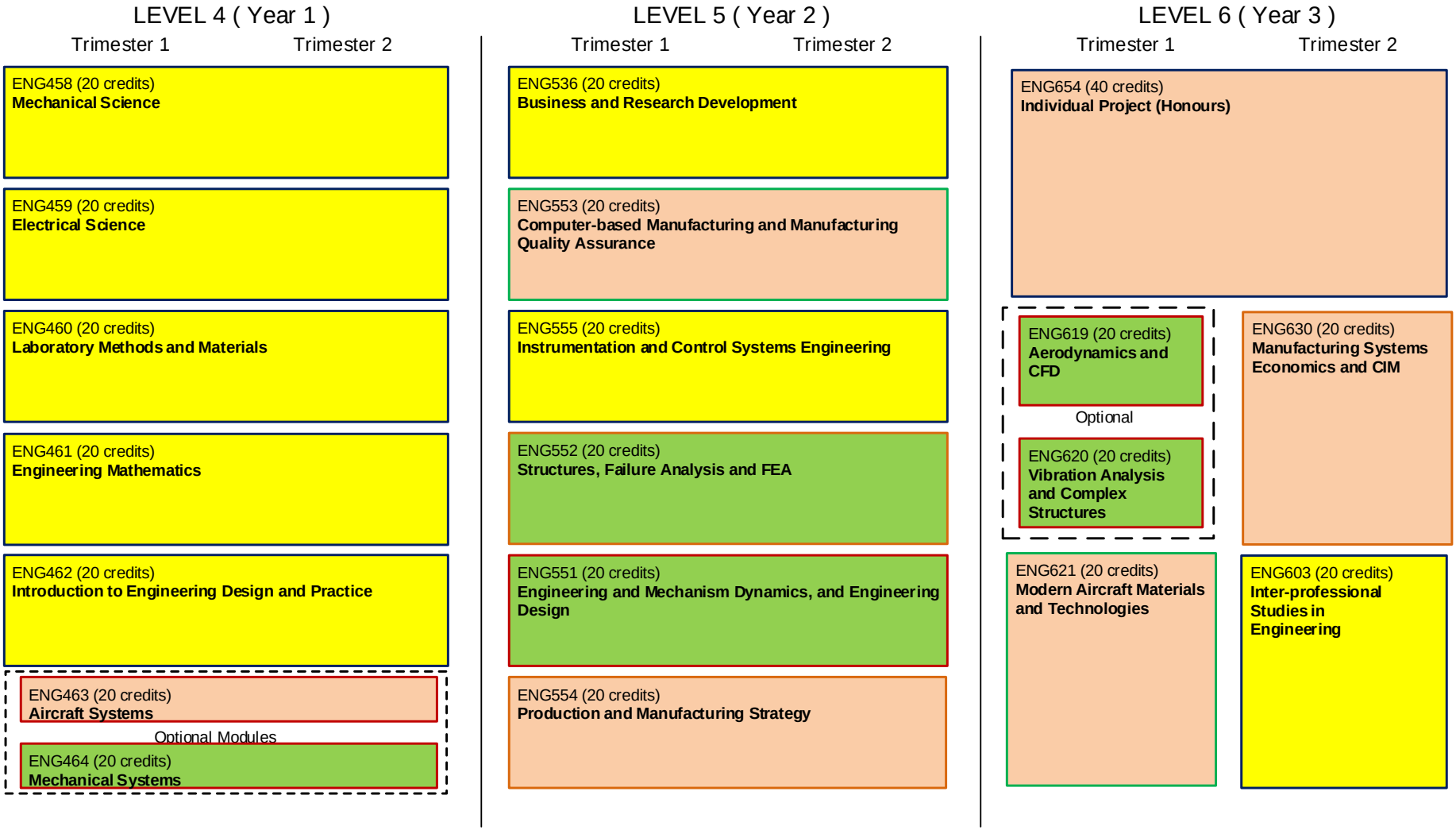


Figure 1 (c)

BEng(Ordinary) Aeronautical and Mechanical Engineering (one-year top-up)

LEVEL 4 and part of LEVEL 5

AP(E)L

120 Credits for Level 4 and
60 Credits for Level 5

LEVEL 5/6

Trimester 1 | Trimester 2

ENG555 (20 credits)
Instrumentation and Control Systems Engineering

ENG552 (20 credits)
Structures, Failure Analysis and FEA

ENG590 (20 credits)
Design and Analytical Techniques

ENG603 (20 credits)
Inter-Professional Studies for Engineering

ENG620 (20 credits)
Vibration Analysis and Complex Structures

ENG610 (20 credits)
Project (Ordinary)

Figure 1(d)

MEng(Hons) in Performance Car Technology

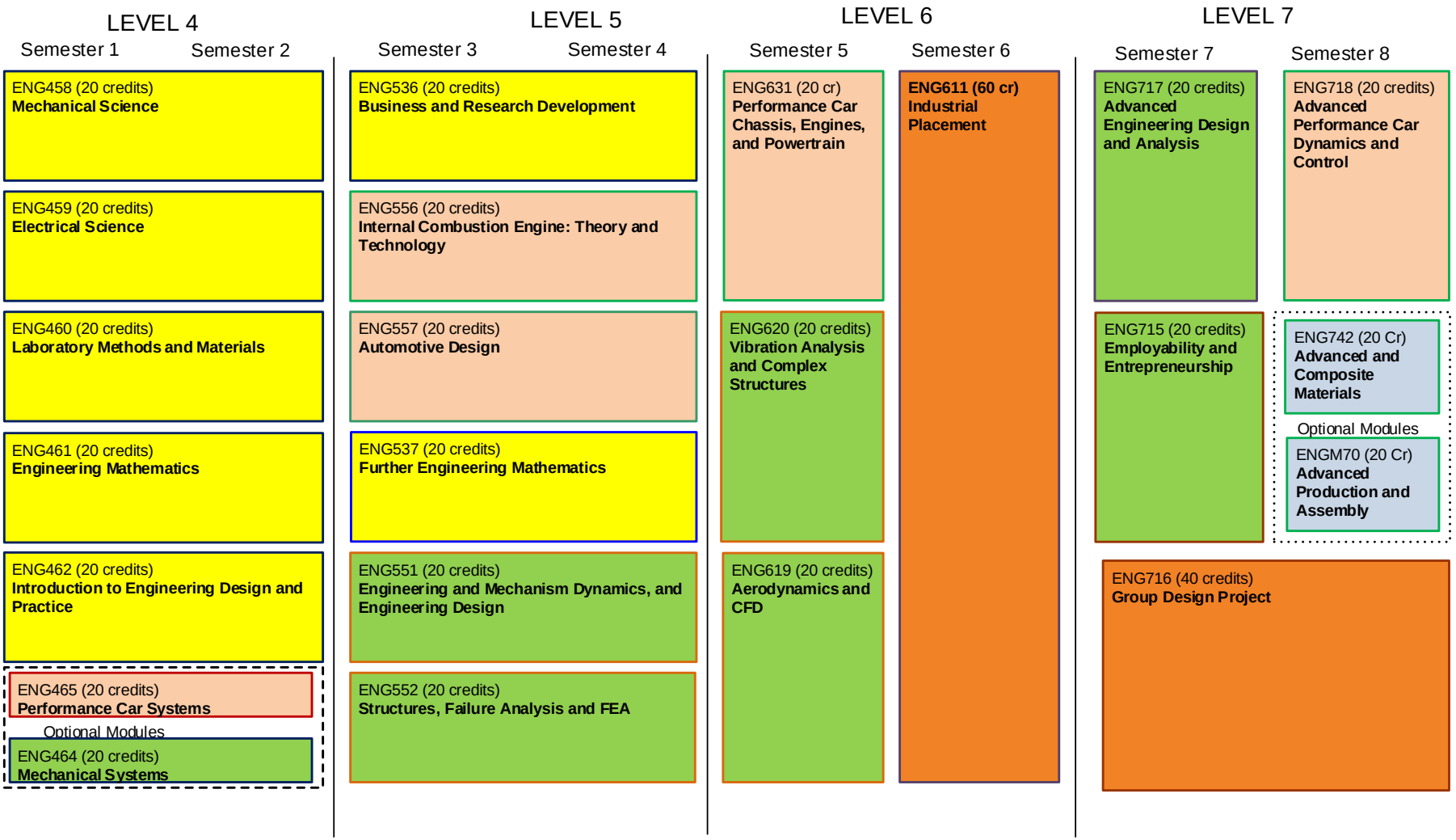


Figure 1 (e)

BEng(Hons) in Performance Car Technology

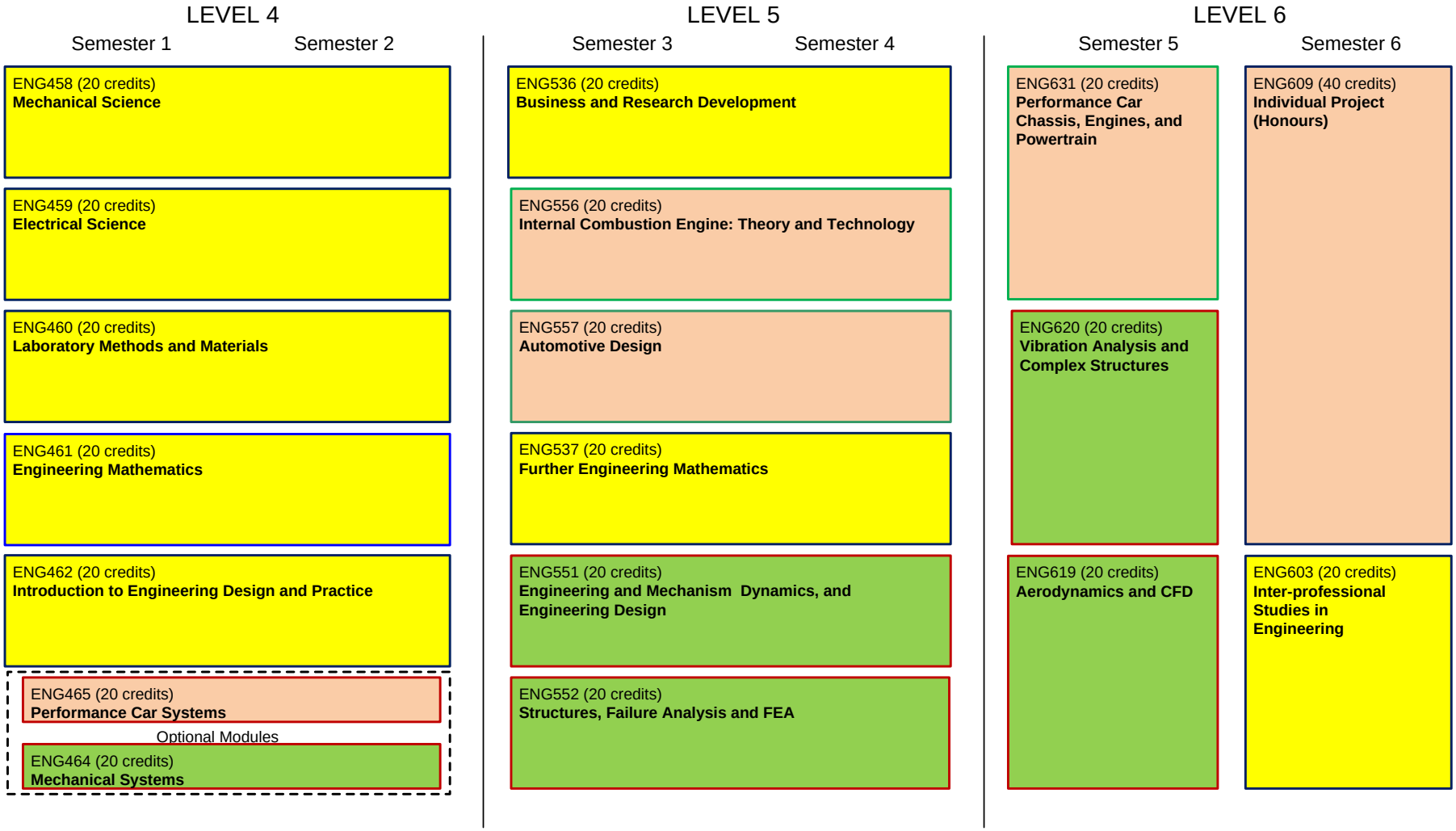


Figure 1 (f)

BSc(Hons) Motorsport Design and Management

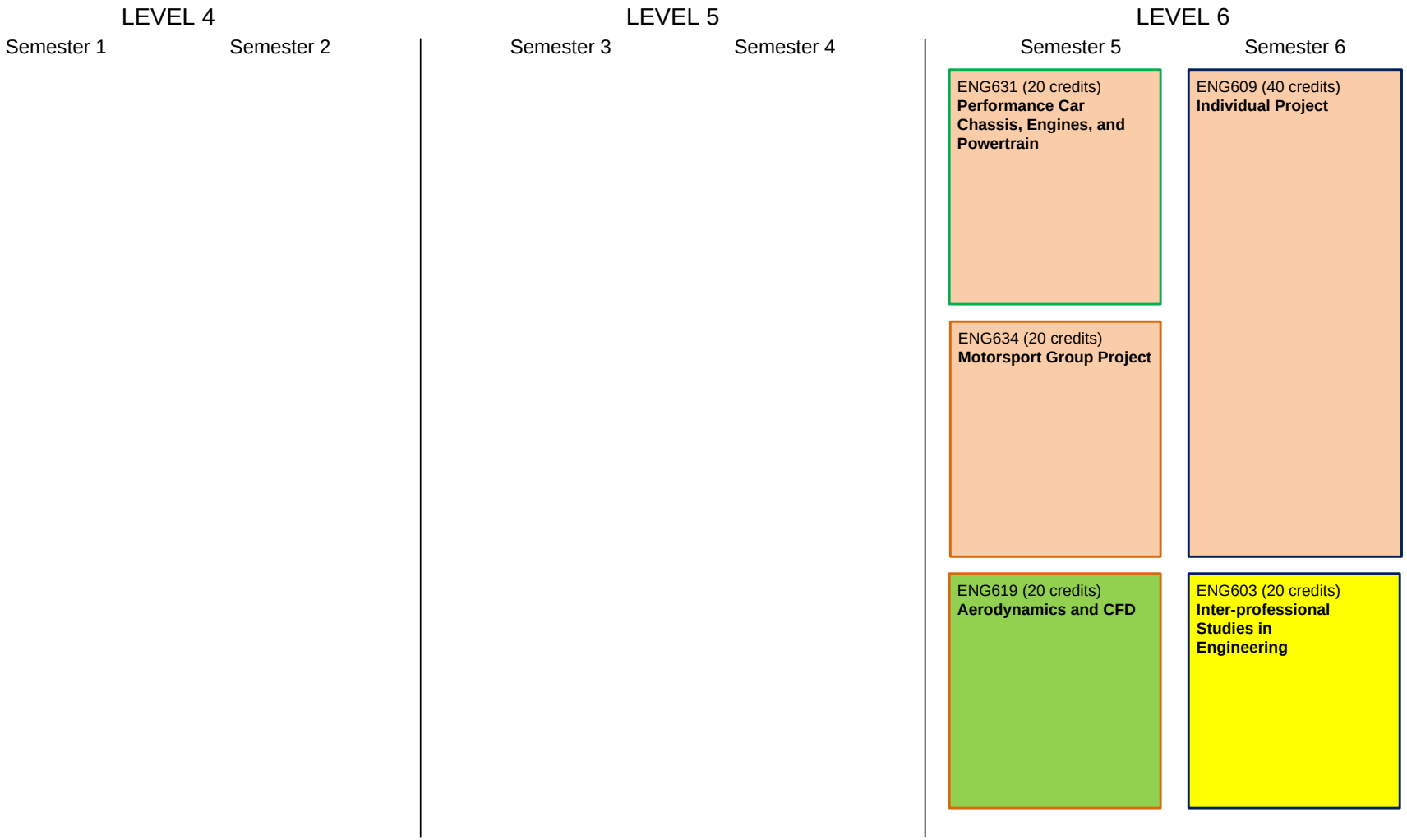


Figure 1(g)

The BEng (Hons) Aeronautical and Mechanical Engineering, BEng (Hons) Aeronautical and Mechanical Manufacturing, and BEng (Hons) Performance Car Technology programmes are also offered part-time to serve local industries.

Part-time delivery arrangements/structures for Level 5 and Level 6 of the corresponding programmes are shown in **Figure 2** below. Level 5 part-time delivery will last for 2 academic years (year-A/year-B pattern or year-B/year A pattern). There are two patterns of part-time delivery for the Level 6 of programmes: two-academic-year one-day-release pattern and one-calendar-year two-day-release pattern.

Level 4 of the corresponding programmes are only delivered in full-time basis.

Part-Time Level 5 Delivery Pattern for
BEng(Hons) in Aeronautical & Mechanical Engineering

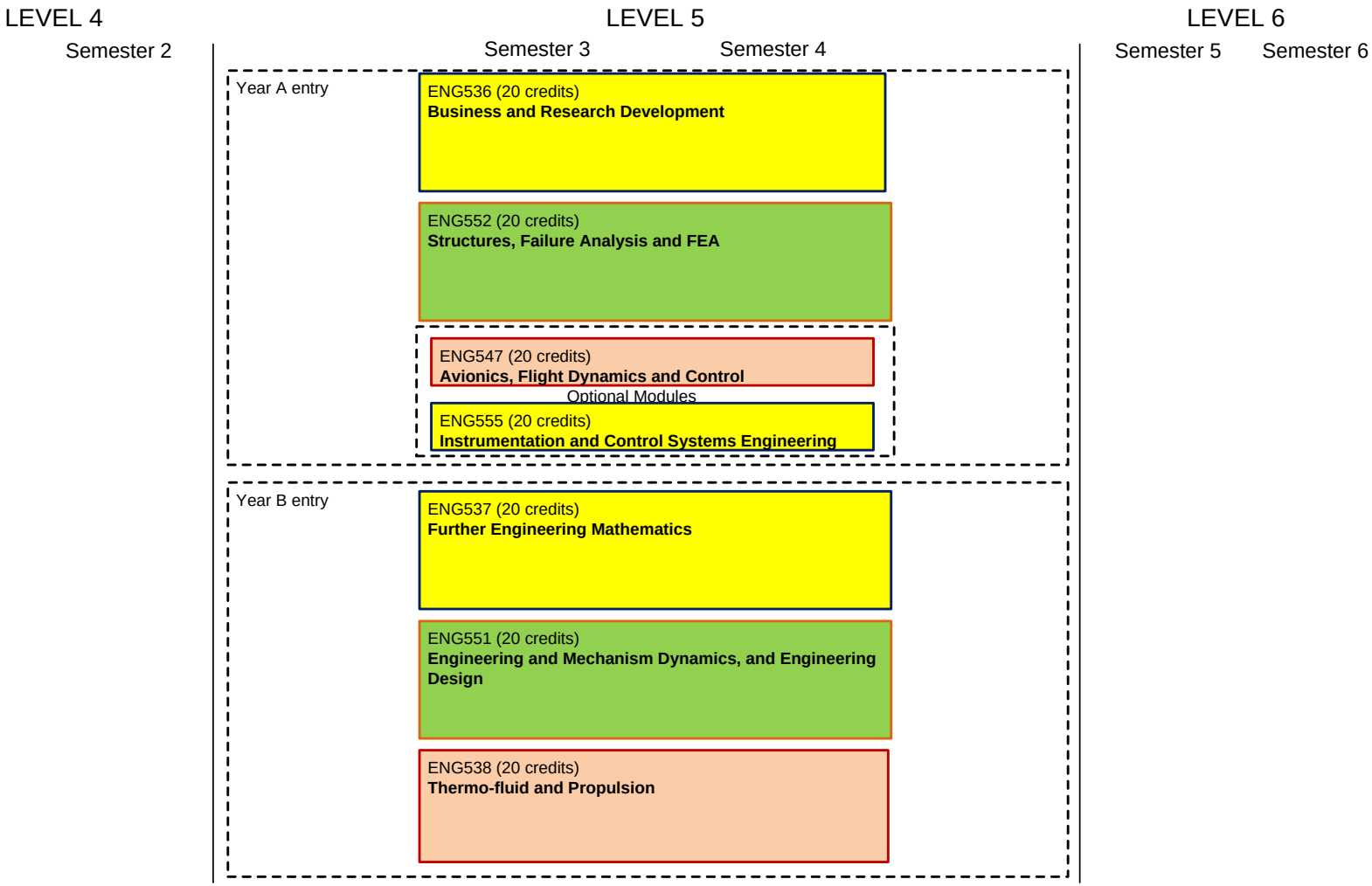


Figure 2 (a)

Part-Time Two-year One-day-release Pattern of delivery for the Level 6 of BEng(Hons) in Aeronautical & Mechanical Engineering

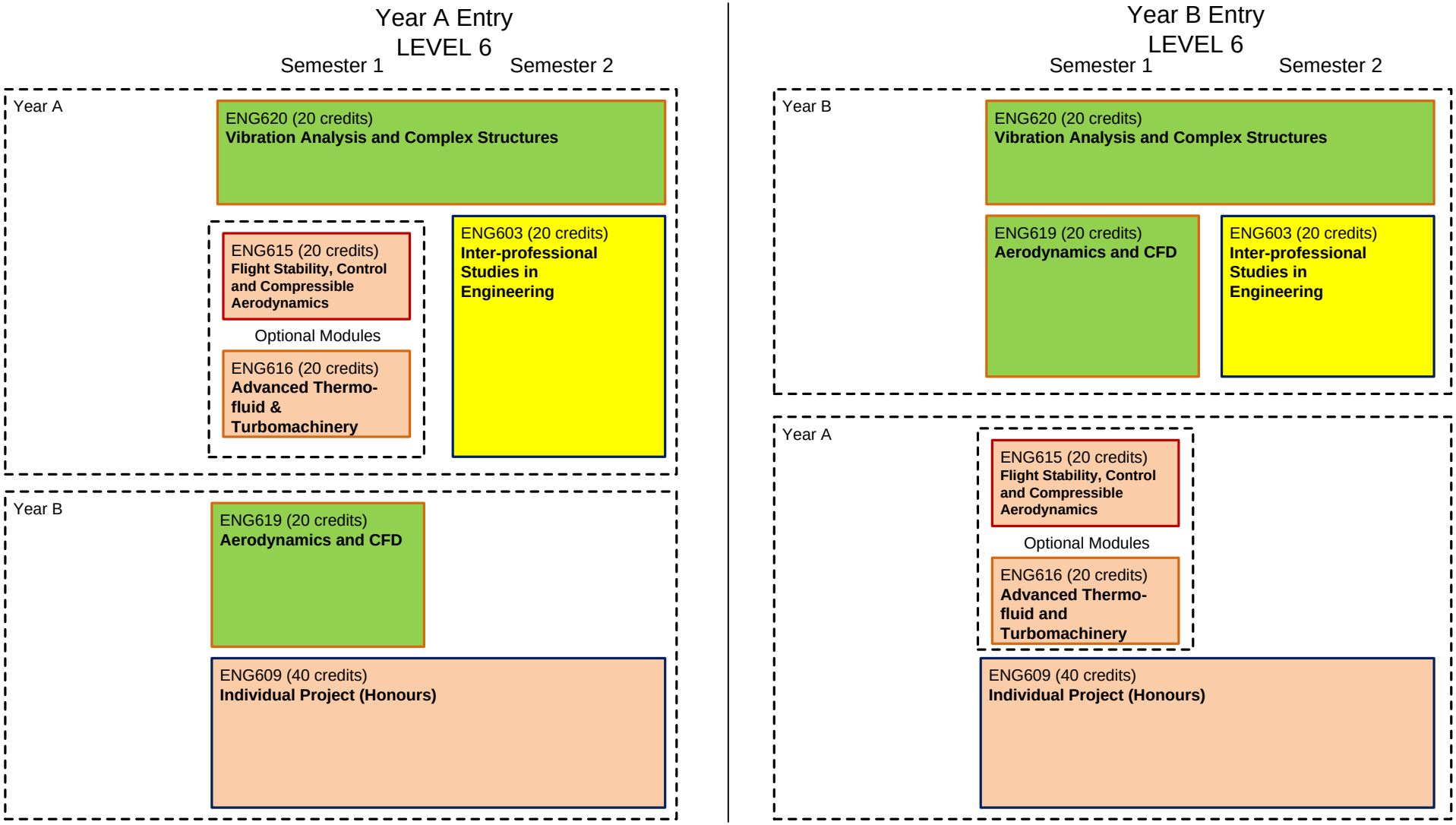


Figure 2(b)

Part-Time One-calendar-year Two-day-release Pattern of delivery for the Level 6 of BEng(Hons) in Aeronautical & Mechanical Engineering

LEVEL 6

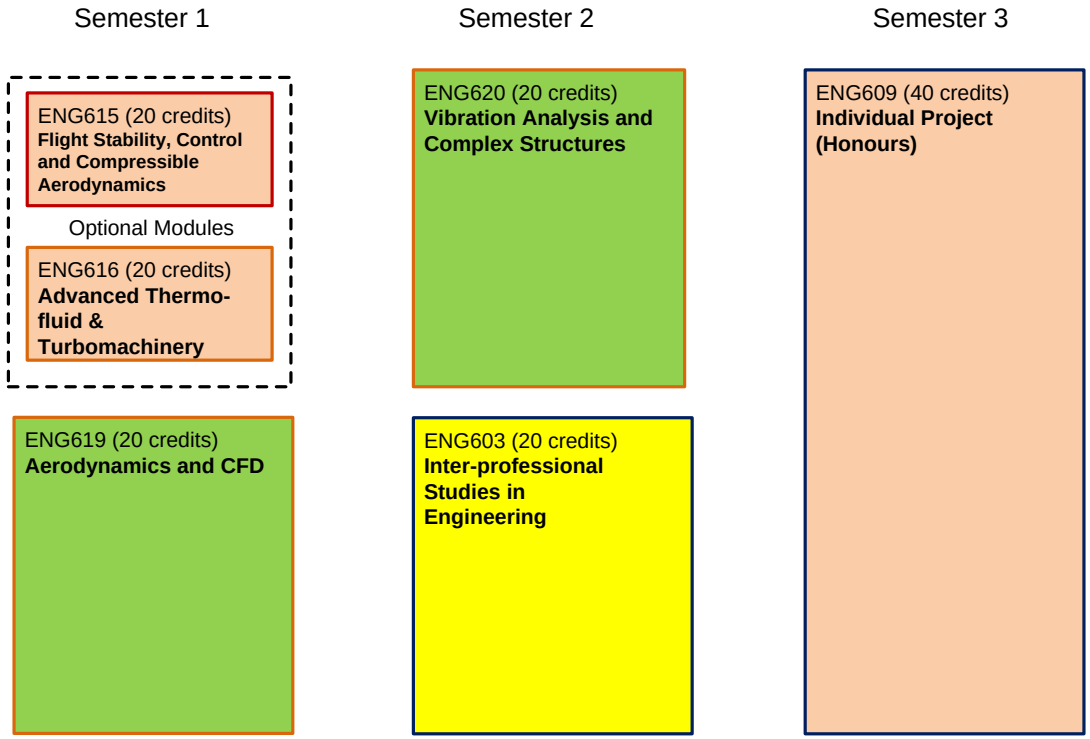


Figure 2(c)

Part-Time Two-year One-day-release Pattern of delivery for the Level 6 of BEng(Hons) in Aeronautical & Mechanical Manufacturing

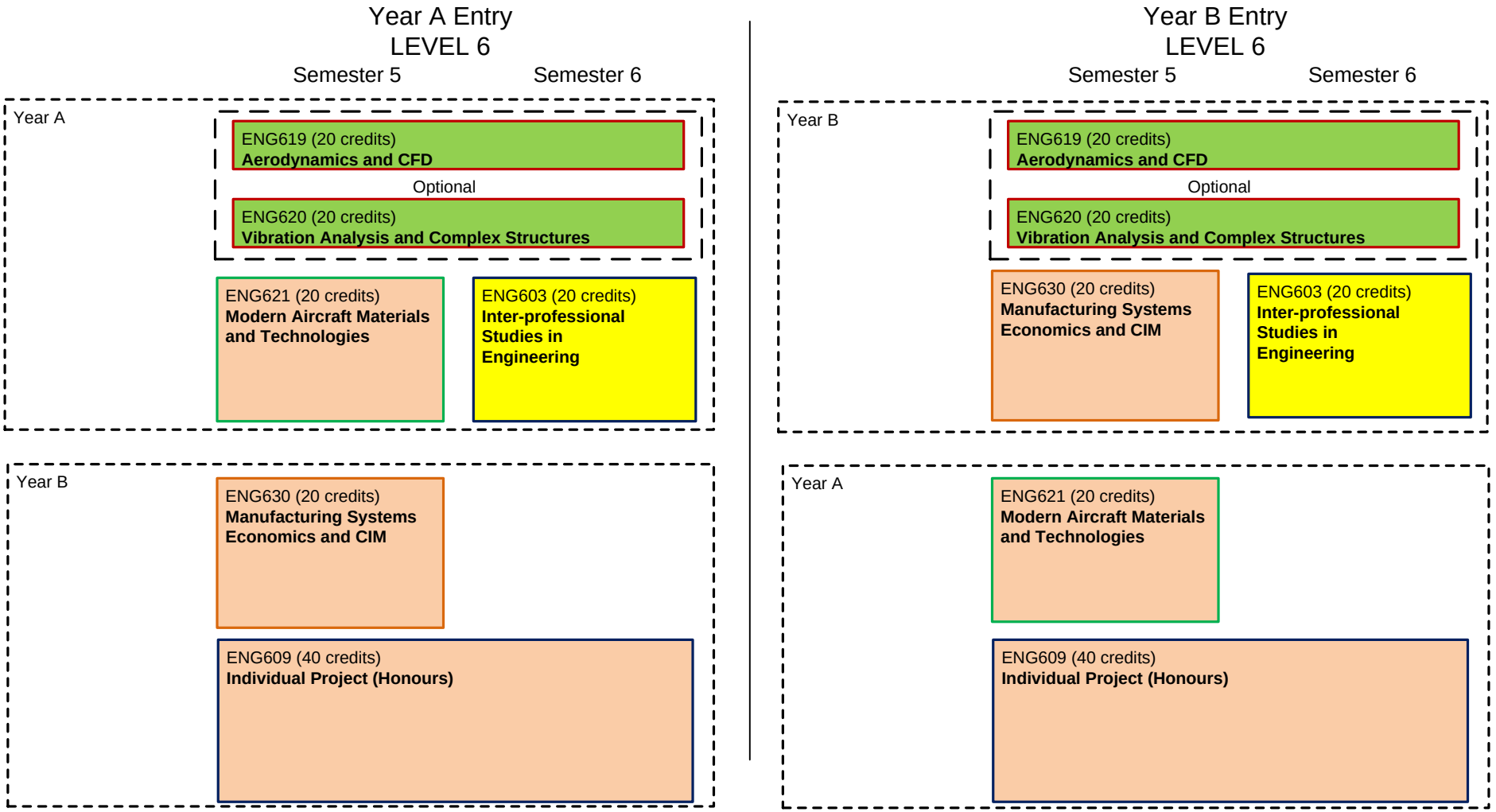


Figure 2(d)

Part-time One-calendar-year Two-day-release Pattern of delivery for the Level 6 of BEng(Hons) in Aeronautical & Mechanical Manufacturing

LEVEL 6

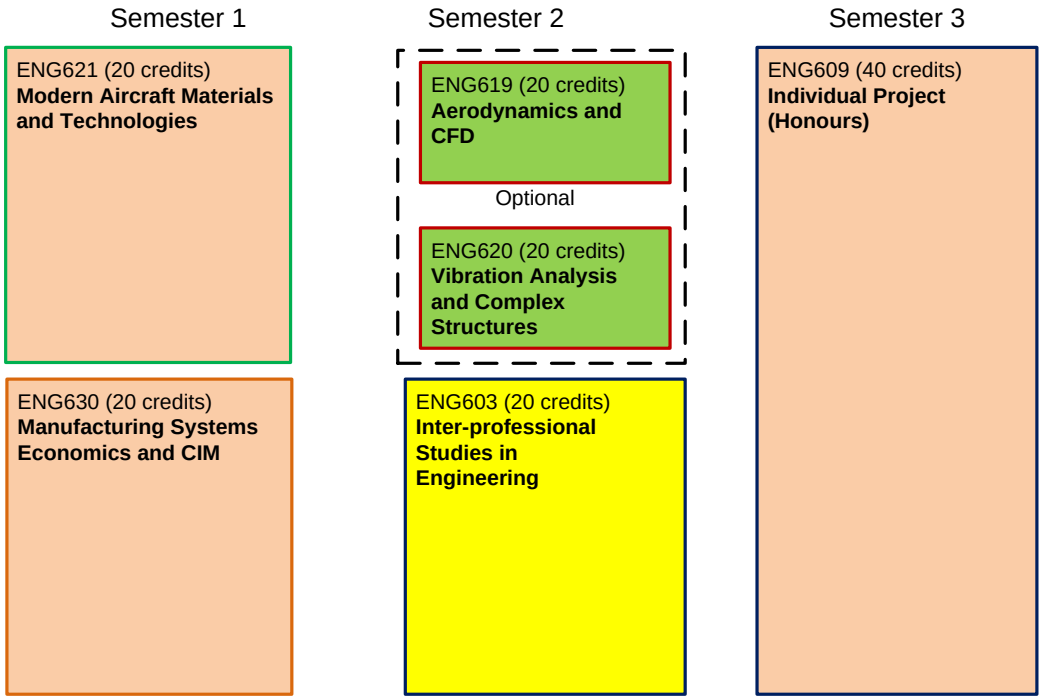


Figure 2(e)

Part-Time Level 5 Delivery Pattern for
BEng(Hons) in Performance Car Technology

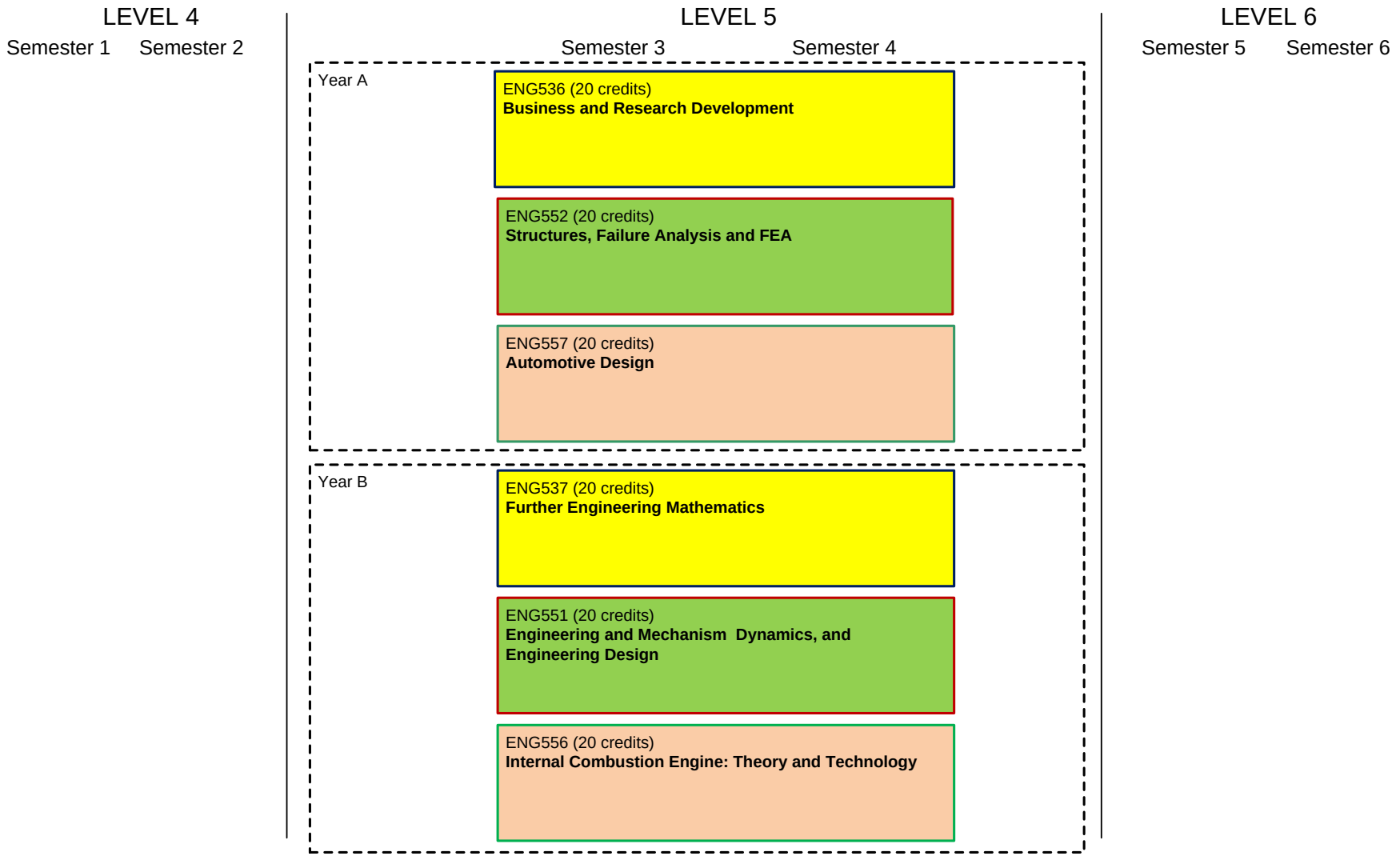


Figure 2(f)

Part-time Two-year One-day-release Pattern of delivery for the Level 6 of BEng(Hons) in Performance Car Technology

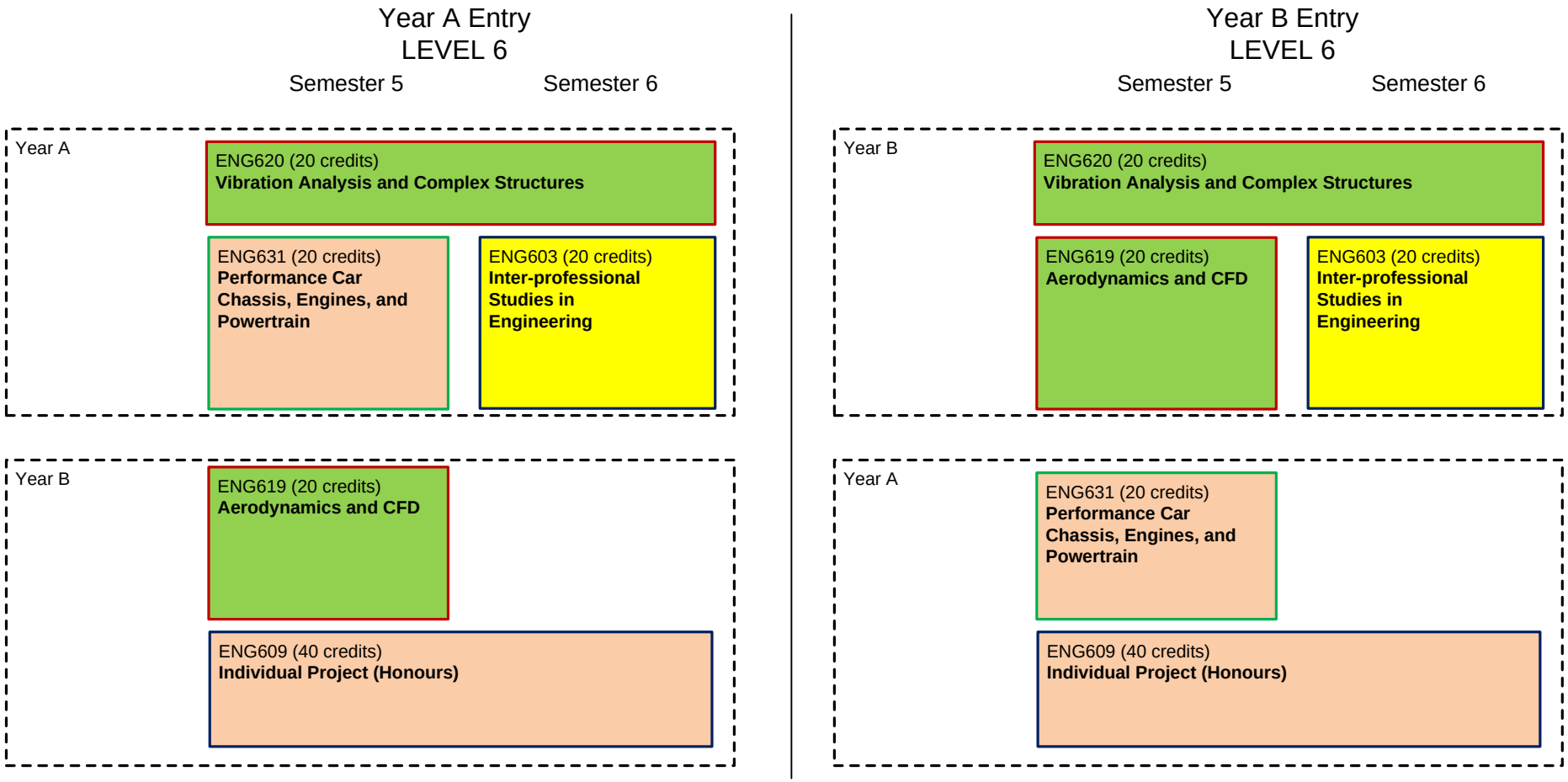


Figure 2(g)

1. MEng in Aeronautical and Mechanical Engineering

Modes of study: Full-time, four years. The programme structure and the arrangement for module delivery are shown in **Figure 1 (a)**.

2. BEng (Hons) in Aeronautical and Mechanical Engineering

Modes of study: Full-time or part-time.

The planned length for the full-time mode is three years. The programme structure and the arrangement for full-time delivery are shown in **Figure 1 (b)**.

No part-time for the level 4.

Part-time delivery for level 5 modules is based on a one-day-release pattern, which is shown in **Figure 2(a)**.

Part-time students are subject to the same regulations as full-time students. However, each level of study takes place over two years and follows the pattern defined in the table below. The part-time students study level 5 with 'Year A' offered alternately with 'Year B' – on a rolling basis. Students can commence with either of these thus two intakes will typically be studying together.

Part-time delivery for level 6 modules is based on either a two-year one-day-release pattern which is shown in **Figure 2(b)**, or a one-calendar-year two-day release pattern shown in **Figure 2(c)**.

Two-year one-day-release pattern: (shown in **Figure 2(b)**)
The Individual Project (Honours) is always in the second year at the level 6. The module Vibration Analysis and Complex Structures will be delivered in a 'long-thin' pattern which lasts for two semesters (Vibration Analysis in semester one and Complex Structures in semester two). The two sets of modules (start with year A or start with year B) alternate.

One-calendar-year two-day-release pattern: (shown in **Figure 2(c)**)
The module Vibration Analysis and Complex Structures will be delivered in semester 2. The Individual Project (Honours) will start in semester Three.

3. BEng (Hons) in Aeronautical and Mechanical Manufacturing

Modes of study: Full-time or part-time.
The planned length for the full-time mode is three years. The programme structure and the arrangement for full-time delivery are shown in **Figure 1 (c)**.

No part-time for the level 4 and level 5.

Part-time delivery for level 6 modules of BEng (Hons) in Aeronautical and Mechanical Manufacturing is based on either a two-year one-day-release pattern which is shown in Figure 2(d), or a one-calendar-year two-two day release pattern shown in **Figure 2(e)**.

Two-year one-day-release pattern: (shown in **Figure 2(d)**)
The Individual Project (Honours) is always in the second year at the level 6. The module Vibration Analysis and Complex Structures will be delivered in a 'long-thin' pattern which lasts for two semesters (Vibration Analysis in semester one and Complex Structures in semester two). The two sets of modules (start with year A or start with year B) alternate.

One-calendar-year two-day-release pattern: (shown in **Figure 2(e)**)
The module Vibration Analysis and Complex Structures will be delivered in semester 2. The Individual Project (Honours) will start in semester 3.

4. BEng (Ord) Aeronautical and Mechanical Engineering (one year top-up)

Modes of study: Full-time only.
This programme is designed for the European students (particularly for German students) who have done their level 4 and level 5 studies in their relevant engineering courses in our collaborative institute in Europe and transfer to Glyndwr University for their ordinary degree. The programme structure and the arrangement for full-time delivery are shown in **Figure 1 (d)**.

5. MEng in Performance Car Technology

Modes of study: Full-time, four years. The programme structure and the arrangement for module delivery are shown in **Figure 1 (e)**.

6. BEng (Hons) in Performance Car Technology

Modes of study: Full-time or part-time.
The planned length for the full-time mode is three years. The programme structure and the arrangement for full-time delivery are shown in **Figure 1 (f)**.

No part-time for the level 4.

Part-time delivery for level 5 modules is based on a one-day-release pattern which is shown in **Figure 2(f)**. Part-time students are subject to the same regulations as full-time students. However, each level of study takes place over two years and follows the pattern defined in the table below. The part-time students study level 5 with 'Year A' offered alternately with 'Year B' – on a rolling basis. Students can commence with either of these thus two intakes will typically be studying together.

Part-time delivery for level 6 modules is based on a two-year one-day-release pattern, shown in **Figure 2(g)**. The Individual Project (Honours) is always in the second year at the level 6. The module Vibration Analysis and Complex Structures will be delivered in a 'long-thin' pattern which lasts for two semesters (Vibration Analysis in semester one and Complex Structures in semester two). The two sets of modules (start with year A or start with year B) alternate.

7. BSc (Hons) Motorsport Design and Management (Level 6 top-up)

Modes of study: Full-time only.
The programme structure and the arrangement for full-time delivery are shown in **Figure 1 (g)**.

Intended learning outcomes of the programmes

The intended learning outcomes for these programmes follow a spiral curriculum with the intention being that outcomes are built upon at each Level. The following learning outcomes have been differentiated according to the QAA Framework for HE qualifications and the Engineering Council UK SPEC programme learning outcomes:

Intended Programme Learning outcomes for the Certificate of Higher Education in Engineering

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Describe the essential scientific principles and methodology, including: mechanical science and systems, engineering materials, and fundamentals of electrical circuits and systems, necessary to underpin their education in engineering;

A2. Describe the basic mathematical principles necessary to underpin their education in engineering and to enable them to apply mathematical methods, tools, and notation in the analysis and solution of simple engineering problems.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Identify and describe the basic engineering principles and apply them to given key engineering processes;

B2. Identify and describe the performance of systems and components through the use of fundamental analytical methods and modelling techniques.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Solve given problems and understand constraints including health and safety and risk assessments;

C2. Use specified design processes;

C3. Use specified materials, equipment, processes, or products;

C4. Work safely in a systematic supervised workshop or laboratory environment while using specified tools and techniques.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of health and safety issues;

D2. Understand the need for economic efficiency in engineering;

D3. Understand the need for high standards of engineering practice and professional and ethical conduct.

Intended Programme Learning outcomes for the Diploma of Higher Education in Aeronautical and Mechanical Engineering

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain the essential engineering principles and methodology, including: structures, dynamics, thermo-fluid mechanics, systems and control, and fundamental electrical and electronic applications, necessary to underpin their education in aeronautical and mechanical engineering discipline to enable appreciation of its scientific and engineering context;

A2. Identify and explain the essential mathematical principles necessary to underpin their education in engineering and to enable them to apply mathematical methods, tools, and notation in the analysis and solution of engineering problems;

A3. Apply engineering principles methodology in problem solving in aeronautical and mechanical engineering.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Analyse, evaluate, and identify engineering principles and apply them to analyse essential key engineering processes;

B2. Identify, classify, and describe the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply given quantitative methods and computer software tools relevant to aeronautical and mechanical engineering discipline in order to solve engineering problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Solve straightforward problems and understand constraints including health and safety and risk assessments;

C2. Use specific design processes and evaluate outcomes;

C3. Use specific materials, equipment, processes, or products;

C4. Work safely in a supervised workshop or laboratory environment while using specific tools and techniques;

C5. Understand customer and user needs;

C6. Accept responsibility for implementing given cost drivers.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of health, safety, and risk issues;

D2. Understand commercial and economic context of specific engineering processes;

D3. Apply high standards of engineering practice and professional and ethical conduct;

D4. Apply business management techniques which may be used to achieve certain engineering objectives within that context.

Intended Programme Learning outcomes for the Diploma of Higher Education in Aeronautical and Mechanical Manufacturing

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain the essential engineering principles and methodology, including: structures, dynamics, thermo-fluid mechanics, systems and control, and fundamental electrical and electronic applications, necessary to underpin their education in aeronautical and mechanical manufacturing discipline to enable appreciation of its scientific and engineering context;

A2. Identify and explain the essential mathematical principles necessary to underpin their education in engineering and to enable them to apply mathematical methods, tools, and notation in the analysis and solution of engineering problems;

A3. Apply engineering principles methodology in problems solving in aeronautical and mechanical manufacturing processes.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Analyse, evaluate, and identify engineering principles and apply them to analyse essential key engineering processes;

B2. Identify, classify, and describe the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply given quantitative methods and computer software tools relevant to aeronautical and mechanical manufacturing discipline in order to solve engineering problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Solve straightforward problems and understand constraints including health and safety and risk assessments;

C2. Use specific design processes and evaluate outcomes;

C3. Use specific materials, equipment, processes, or products;

C4. Work safely in a supervised workshop or laboratory environment while using specific tools and techniques;

C5. Understand customer and user needs;

C6. Accept responsibility for implementing given cost drivers.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of health, safety, and risk issues in aeronautical and mechanical manufacturing processes;

D2. Understand commercial and economic context of specific manufacturing processes;

D3. Apply high standards of engineering practice and professional and ethical conduct;

D4. Apply business management techniques which may be used to achieve certain engineering objectives within that context.

Intended Programme Learning outcomes for the Diploma of Higher Education in Performance Car Technology

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain the essential engineering principles and methodology, including: structures, dynamics, thermo-fluid mechanics, systems and control, and fundamental electrical and electronic applications, necessary to underpin their education in performance car technologies to enable appreciation of its scientific and engineering context;

A2. Identify and explain the essential mathematical principles necessary to underpin their education in engineering and to enable them to apply mathematical methods, tools, and notation in the analysis and solution of engineering problems;

A3. Apply engineering principles methodology in problems solving in performance car industries.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Analyse, evaluate, and identify engineering principles and apply them to analyse essential key engineering processes;

B2. Identify, classify, and describe the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply given quantitative methods and computer software tools relevant to performance car industries in order to solve engineering problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Solve straightforward problems and understand constraints including health and safety and risk assessments;

C2. Use specific design processes and evaluate outcomes;

C3. Use specific materials, equipment, processes, or products;

C4. Work safely in a supervised workshop or laboratory environment while using specific tools and techniques;

C5. Understand customer and user needs;

C6. Accept responsibility for implementing given cost drivers.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of health, safety, and risk issues in performance car industries;

D2. Understand commercial and economic context of specific manufacturing processes;

D3. Apply high standards of engineering practice and professional and ethical conduct;

D4. Apply business management techniques which may be used to achieve certain engineering objectives within that context.

Intended Programme Learning outcomes for the Bachelor of Engineering (Ordinary) in Aeronautical and Mechanical Engineering

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details, scientific principles and methodology, including: mechanical sciences, properties of materials, systems and control, and fundamentals of electrical and electronic systems, necessary to underpin their education in aeronautical and mechanical engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical and current developments and technologies;

A2. Identify and explain, in sufficient details, mathematical principles necessary to underpin their education in aeronautical and mechanical engineering discipline and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of engineering problems, including limited complex ones;

A3. Apply knowledge and understanding of some engineering disciplines such as: structures, dynamics, systems and control, and/or manufacturing systems engineering to support study in engineering;

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and analyse the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve aeronautical and mechanical engineering problems;

B4. Understand the need of a systems approach when dealing with aeronautical and mechanical engineering problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for the broad aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use a range of materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using specific tools and techniques;

C5. Understand customer and user needs and the importance of considerations such as aesthetics;

C6. Take some responsibilities for initiating, identifying, and implementing cost drivers;

C7. Manage the design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of aeronautical and mechanical engineering projects;

C9. Include academic publications to collect and evaluate technical literature and other information sources;
C10. Demonstrate awareness of nature of intellectual property and contractual issues;
C11. Understand the codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in aeronautical and mechanical engineering.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of key legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of aeronautical and mechanical engineering processes;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve main engineering objectives within that context;
D5. Understand the constraint associated with engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the Bachelor of Engineering (Ordinary) in Aeronautical and Mechanical Manufacturing

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details, scientific principles and methodology, including: mechanical sciences, manufacturing principles, properties of materials, systems and control, and fundamentals of electrical and electronic systems, necessary to underpin their education in aeronautical and mechanical manufacturing discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical and current developments and technologies in manufacturing;

A2. Identify and explain, in sufficient details, mathematical principles necessary to underpin their education in aeronautical and mechanical manufacturing discipline and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of manufacturing system design, implementation and management problems, including limited complex ones;

A3. Apply knowledge and understanding of some engineering disciplines such as: materials, systems and control, and/or mechanical engineering and systems to support study in engineering;

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and analyse the performance of manufacturing systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve aeronautical and mechanical manufacturing problems;

B4. Understand the need of a systems approach when dealing with aeronautical and mechanical manufacturing problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues in manufacturing processes;

C2. Ensure fitness for purpose for the broad aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use a range of materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using specific tools and techniques;

C5. Understand customer and user needs and the importance of considerations such as aesthetics;

C6. Take some responsibilities for initiating, identifying, and implementing cost drivers;

C7. Manage the design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of aeronautical and mechanical manufacturing projects;

C9. Include academic publications to collect and evaluate technical literature and other information sources;
C10. Demonstrate awareness of nature of intellectual property and contractual issues;
C11. Understand the codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in aeronautical and mechanical manufacturing processes.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of key legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of aeronautical and mechanical manufacturing processes;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve main engineering objectives within that context;
D5. Understand the constraint associated with engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the Bachelor of Engineering (Ordinary) in Performance Car Technology

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details, scientific principles and methodology, including: mechanical sciences, manufacturing principles, properties of materials, systems and control, and fundamentals of electrical and electronic systems, necessary to underpin their education in performance car discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical and current developments and technologies in performance car;

A2. Identify and explain, in sufficient details, mathematical principles necessary to underpin their education in aeronautical and mechanical manufacturing discipline and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of performance car design and development problems, including limited complex ones;

A3. Apply knowledge and understanding of some engineering disciplines such as: materials, manufacturing, systems and control, and/or mechanical engineering and systems to support study in engineering;

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and analyse the performance of performance car systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve performance car design and development problems;

B4. Understand the need of a systems approach when dealing with problems in performance car industries.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues in performance car industries;

C2. Ensure fitness for purpose for the broad aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use a range of materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using specific tools and techniques;

C5. Understand customer and user needs and the importance of considerations such as aesthetics;

C6. Take some responsibilities for initiating, identifying, and implementing cost drivers;

C7. Manage the design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of performance car projects;

C9. Include academic publications to collect and evaluate technical literature and other information sources;

C10. Demonstrate awareness of nature of intellectual property and contractual issues;
C11. Understand the codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in performance car industries.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of key legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of performance car industries;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve main engineering objectives within that context;
D5. Understand the constraint associated with engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the Bachelor of Engineering (Honours) in Aeronautical and Mechanical Engineering

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details and broadness, scientific principles and methodology, including: mechanical sciences, properties of materials, systems and control, and fundamentals of electrical and electronic systems, necessary to underpin their education in aeronautical and mechanical engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;

A2. Identify and explain, in sufficient details and broadness, mathematical principles necessary to underpin their education in aeronautical and mechanical engineering discipline, and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex engineering problems;

A3. Apply and integrate knowledge and understanding of broader engineering disciplines such as: renewable energy engineering and/or systems and control engineering and/or manufacturing systems engineering to support study in aeronautical and mechanical engineering discipline.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by critically evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and critically analyse the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve complex aeronautical and mechanical engineering problems;

B4. Apply systems approaches to aeronautical and mechanical engineering problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define complex problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use appropriate materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;

C5. Define customer and user needs and the importance of considerations such as aesthetics;

C6. Take responsibility for initiating, identifying, and implementing cost drivers;

C7. Manage the whole design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of aeronautical and mechanical engineering projects, as well as operation and maintenance of industrial processes;

C9. Include some current research and academic publications to collect and evaluate technical literature and other information sources;

C10. Demonstrate awareness of nature of intellectual property and contractual issues;
C11. Apply appropriate codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in aeronautical and mechanical engineering;
C13. Use creativity to establish innovative solutions;
C14. Work with technical uncertainties in aeronautical and mechanical engineering.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of aeronautical and mechanical engineering processes;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve engineering objectives within that context;
D5. Understand the requirement for engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the Bachelor of Engineering (Honours) in Aeronautical and Mechanical Manufacturing

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details and broadness, scientific principles and methodology, including: mechanical sciences, manufacturing principles, properties of materials, systems and control, and fundamentals of electrical and electronic systems, necessary to underpin their education in aeronautical and mechanical manufacturing discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;

A2. Identify and explain, in sufficient details and broadness, mathematical principles necessary to underpin their education in aeronautical and mechanical manufacturing discipline, and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex engineering problems;

A3. Apply and integrate knowledge and understanding of broader engineering disciplines such as: renewable energy engineering and/or systems and control engineering and/or mechanical engineering and systems to support study in aeronautical and mechanical manufacturing discipline.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by critically evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and critically analyse the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve complex aeronautical and mechanical manufacturing problems;

B4. Apply systems approaches to aeronautical and mechanical manufacturing problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define complex problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use appropriate materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;

C5. Define customer and user needs and the importance of considerations such as aesthetics;

C6. Take responsibility for initiating, identifying, and implementing cost drivers;

C7. Manage the whole design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of aeronautical and mechanical manufacturing projects, as well as operation and maintenance of industrial processes;

C9. Include some current research and academic publications to collect and evaluate technical literature and other information sources;
C10. Demonstrate awareness of nature of intellectual property and contractual issues;
C11. Apply appropriate codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in aeronautical and mechanical manufacturing processes;
C13. Use creativity to establish innovative solutions;
C14. Work with technical uncertainties in aeronautical and mechanical manufacturing design and development.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of aeronautical and mechanical manufacturing processes;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve engineering objectives within that context;
D5. Understand the requirement for engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the Bachelor of Engineering (Honours) in Performance Car Technology

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details and broadness, scientific principles and methodology, including: mechanical sciences, manufacturing principles, properties of materials, systems and control, and fundamentals of electrical and electronic systems, necessary to underpin their education in performance car technology discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;

A2. Identify and explain, in sufficient details and broadness, mathematical principles necessary to underpin their education in performance car discipline, and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex engineering problems;

A3. Apply and integrate knowledge and understanding of broader engineering disciplines such as: renewable energy engineering and/or systems and control engineering and/or mechanical engineering and systems to support study in performance car discipline.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by critically evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and critically analyse the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve complex performance car design and development problems;

B4. Apply systems approaches to performance car problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define complex problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use appropriate materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;

C5. Define customer and user needs and the importance of considerations such as aesthetics;

C6. Take responsibility for initiating, identifying, and implementing cost drivers;

C7. Manage the whole design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of performance car projects, as well as operation and maintenance in performance car industries;

C9. Include some current research and academic publications to collect and evaluate technical literature and other information sources;

C10. Demonstrate awareness of nature of intellectual property and contractual issues;

C11. Apply appropriate codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in performance car industries;
C13. Use creativity to establish innovative solutions;
C14. Work with technical uncertainties in performance car design and development.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of performance car industries;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve engineering objectives within that context;
D5. Understand the requirement for engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the Bachelor of Science (Honours) in Motorsport Design and Management

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Identify and explain, in sufficient details and broadness, scientific principles and methodology, including: mechanical sciences, manufacturing principles, properties of materials, systems and control, and fundamentals of business management, necessary to underpin their education in motorsport design and management discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;

A2. Identify and explain, in sufficient details and broadness, mathematical principles necessary to underpin their education in motorsport design and management discipline, and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex engineering problems;

A3. Apply and integrate knowledge and understanding of broader engineering disciplines such as: renewable energy engineering and/or systems and control engineering and/or mechanical manufacturing and processes to support study in performance car discipline.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by critically evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;

B2. Identify, classify, and critically analyse the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply and select appropriate quantitative methods and computer software tools relevant to the mechanical engineering disciplines in order to solve motorsport design and management problems;

B4. Apply systems approaches to motorsport design problems.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define complex problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;

C3. Select and use appropriate materials, equipment, processes, or products;

C4. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;

C5. Define customer and user needs and the importance of considerations such as aesthetics;

C6. Take responsibility for initiating, identifying, and implementing cost drivers;

C7. Manage the whole design process and evaluate outcomes;

C8. Identify and use the professional engineering principles applicable to the management of motorsport design and management projects, as well as operation in motorsport industries;

C9. Include some current research and academic publications to collect and evaluate technical literature and other information sources;

C10. Demonstrate awareness of nature of intellectual property and contractual issues;

C11. Apply appropriate codes of practice and industry standards;
C12. Demonstrate awareness of quality issues in motorsport industries;
C13. Use creativity to establish innovative solutions;
C14. Work with technical uncertainties in motorsport design and management.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Demonstrate awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Identify commercial and economic context of motorsport industries;
D3. Understand the need for a high level of professional and ethical conduct in engineering;
D4. Apply management techniques, which may be used to achieve engineering objectives within that context;
D5. Understand the requirement for engineering activities to promote sustainable development.

Intended Programme Learning outcomes for the MEng in Aeronautical and Mechanical Engineering

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Investigate, apply and comprehensively explain scientific principles and methodology, including: electricity, mechanical sciences, properties of materials, systems and control, and electrical and electronic systems, necessary to underpin their education in aeronautical and mechanical engineering discipline, to enable appreciation of its scientific and engineering context, and to support their awareness of developing technologies related to their engineering disciplines;

A2. Integrate, apply and comprehensively explain mathematical principles necessary to underpin their education in aeronautical and mechanical engineering discipline and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex and conceptually challenging engineering problems;

A3. Extend knowledge and understanding of other engineering disciplines such as renewable engineering, materials engineering, or manufacturing engineering, to support study in aeronautical and mechanical engineering discipline;

A4. Apply mathematical and computer models relevant to mechanical engineering disciplines and evaluate their limitations;

A5. Understand concepts from outside mechanical engineering and to apply them effectively in aeronautical and mechanical engineering projects.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by critically evaluating fundamental engineering principles to investigate new and emerging technologies;

B2. Identify, classify, critically analyse and synthesise the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply mathematical and computer-based models for solving problems in aeronautical and mechanical engineering, and assess the limitations of particular cases;

B4. Extract data pertinent to an unfamiliar problem and apply in it solution using computer-based engineering tools when appropriate.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define and deal with complex and conceptually challenging problems and evaluate constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;

C3. Thoroughly understand current practice and its limitations, and some appreciation of likely new developments as well as select, use, and evaluate appropriateness of a wide range of engineering materials and components;

C4. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;

C5. Define and critically analyse customer and user needs and the importance of considerations such as aesthetics;
C6. Take full responsibility for initiating, identifying, and amending cost drivers;
C7. Extend knowledge and understanding of design processes and methodologies, apply and adapt them in unfamiliar situations;
C8. Apply engineering techniques taking into account a range of commercial and industrial constraints in aeronautical and mechanical engineering;
C9. Draw heavily on current research and academic publications to collect and evaluate technical literature and other information sources;
C10. Appreciate the nature of intellectual property and contractual issues;
C11. Generate an innovative design for products, systems, components, or processes to fulfil new needs.
C12. Manage quality and reliability issues;
C13. Use creativity systematically to establish innovative solutions;
C14. Work competently with technical uncertainties in aeronautical and mechanical engineering projects.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Extend awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Interpret commercial and economic context of engineering processes;
D3. Apply high level of professional and ethical conduct in aeronautical and mechanical engineering at all time;
D4. Extend knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately;
D5. Recognise the requirement for engineering activities to promote sustainable development;
D6. Make general evaluations of commercial risks through some understanding of the basis of such risks.

Intended Programme Learning outcomes for the MEng in Performance Car Technology

A) Knowledge and Understanding (Underpinning Science and Mathematics):

Students must be able to:

A1. Investigate, apply and comprehensively explain scientific principles and methodology, including: electricity, mechanical sciences, properties of materials, systems and control, and electrical and electronic systems, necessary to underpin their education in performance car technology discipline, to enable appreciation of its scientific and engineering context, and to support their awareness of developing technologies related to their engineering disciplines;

A2. Integrate, apply and comprehensively explain mathematical principles necessary to underpin their education in performance car discipline and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex and conceptually challenging engineering problems;

A3. Extend knowledge and understanding of other engineering disciplines such as renewable engineering, materials engineering, or manufacturing engineering, to support study in performance car technology discipline;

A4. Apply mathematical and computer models relevant to mechanical engineering disciplines and evaluate their limitations;

A5. Understand concepts from outside mechanical engineering and to apply them effectively in performance car design and development projects.

B) Intellectual Skills (Engineering Analysis):

Students must be able to:

B1. Make judgements by critically evaluating fundamental engineering principles to investigate new and emerging technologies;

B2. Identify, classify, critically analyse and synthesise the performance of systems and components through the use of analytical methods and modelling techniques;

B3. Apply mathematical and computer-based models for solving problems in performance car technology, and assess the limitations of particular cases;

B4. Extract data pertinent to an unfamiliar problem and apply in it solution using computer-based engineering tools when appropriate.

C) Subject and Practical Skills (Design and Engineering Practice):

Students must be able to:

C1. Define and deal with complex and conceptually challenging problems and evaluate constraints including environmental and sustainability limitations, health and safety and risk assessment issues;

C2. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;

C3. Thoroughly understand current practice and its limitations, and some appreciation of likely new developments as well as select, use, and evaluate appropriateness of a wide range of engineering materials and components;

C4. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;

C5. Define and critically analyse customer and user needs and the importance of considerations such as aesthetics;

C6. Take full responsibility for initiating, identifying, and amending cost drivers;

C7. Extend knowledge and understanding of design processes and methodologies, apply and adapt them in unfamiliar situations;
C8. Apply engineering techniques taking into account a range of commercial and industrial constraints in performance car projects;
C9. Draw heavily on current research and academic publications to collect and evaluate technical literature and other information sources;
C10. Appreciate the nature of intellectual property and contractual issues;
C11. Generate an innovative design for products, systems, components, or processes to fulfil new needs.
C12. Manage quality and reliability issues;
C13. Use creativity systematically to establish innovative solutions;
C14. Work competently with technical uncertainties in performance car projects.

D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):

Students must be able to:

D1. Extend awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
D2. Interpret commercial and economic context of engineering processes;
D3. Apply high level of professional and ethical conduct in performance car projects at all time;
D4. Extend knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately;
D5. Recognise the requirement for engineering activities to promote sustainable development;
D6. Make general evaluations of commercial risks through some understanding of the basis of such risks.

Curriculum Matrix for MEng Aeronautical and Mechanical Engineering

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills														D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 4																														
ENG458	Mechanical Science	C	X	X				X	X			X																			
ENG459	Electrical Science	C	X	X				X	X			X																			
ENG460	Laboratory Methods and Materials	C	X						X			X		X	X											X	X	X			
ENG461	Engineering Mathematics	C		X					X																						
ENG462	Introduction to Engineering Design and Practice	C						X	X			X	X	X	X											X	X	X			
ENG463	Aircraft Systems	O	X					X	X				X	X	X											X	X				
ENG464	Mechanical Systems	O	X					X	X				X	X	X											X	X				
	Level 5																														
ENG536	Business and Research Development	C										X		X	X	X	X									X	X	X	X		
ENG538	Thermo-fluid and Propulsion	C	X	X	X			X	X	X		X	X																		
ENG537	Further Engineering Mathematics	C		X					X																						
ENG551	Engineering and Mechanism Dynamics and Engineering Design	C	X	X	X			X	X	X		X	X	X		X	X										X	X	X		
ENG552	Structures, Failure Analysis and FEA	C	X	X	X			X	X	X		X	X																		
ENG555	Instrumentation and Control Systems Engineering	O	X	X	X			X	X	X		X	X																		
ENG547	Avionics, Flight Dynamics and Control	O	X	X	X			X	X	X		X	X																		

Curriculum Matrix for MEng Aeronautical and Mechanical Engineering (continued)

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 6																														
ENG611	Industrial Placement	C								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ENG619	Aerodynamics and CFD	C	X	X	X			X	X	X		X												X	X						
ENG620	Vibration Analysis and Complex Structures	C	X	X	X			X	X	X		X													X						
ENG615	Flight Stability, Control and Compressible Aerodynamics	O	X	X	X			X	X	X	X	X													X						
ENG616	Advanced Thermo-fluid and Turbomachinery	O	X	X	X			X	X	X	X	X													X						
	Level 7																														
ENG715	Employability and Entrepreneurship	C										X				X				X	X	X		X		X	X	X	X	X	X
ENG717	Advanced Engineering Design and Analysis	C			X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X
ENG716	Group Design Project	C										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ENGM72	Structures and Numerical Analysis	O	X	X	X	X	X	X	X	X	X	X						X													
ENGM63	Applied Aerodynamics	O	X	X	X	X	X	X	X	X	X	X						X													
ENGM68	Viscous Flow and Heat Transfer	O	X	X	X	X	X	X	X	X	X	X						X													
ENG742	Advanced and Composite Materials	O			X	X	X	X	X	X	X	X	X	X		X		X	X	X		X		X						X	
ENGM70	Advanced Production and Assembly	O			X	X	X	X	X	X	X	X	X	X		X		X	X	X		X		X		X	X		X	X	X

Curriculum Matrix for BEng Aeronautical and Mechanical Engineering

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 4																														
ENG458	Mechanical Science	C	X	X				X	X			X																		
ENG459	Electrical Science	C	X	X				X	X			X																		
ENG460	Laboratory Methods and Materials	C	X						X			X		X	X											X	X	X			
ENG461	Engineering Mathematics	C		X					X																					
ENG462	Introduction to Engineering Design and Practice	C						X	X			X	X	X	X											X	X	X			
ENG463	Aircraft Systems	O	X					X	X				X	X	X											X	X				
ENG464	Mechanical Systems	O	X					X	X				X	X	X											X	X				
	Level 5																														
ENG536	Business and Research Development	C										X		X	X	X	X									X	X	X	X		
ENG538	Thermo-fluid and Propulsion	C	X	X	X			X	X	X		X	X																		
ENG537	Further Engineering Mathematics	C		X					X																					
ENG590	Engineering Design and Analytical Techniques	C	X	X	X			X	X	X		X	X	X		X	X										X	X	X		
ENG552	Structures, Failure Analysis and FEA	C	X	X	X			X	X	X		X	X																		
ENG555	Instrumentation and Control Systems Engineering	O	X	X	X			X	X	X		X	X																		
ENG547	Avionics, Flight Dynamics and Control	O	X	X	X			X	X	X		X	X																		

Curriculum Matrix for BEng Aeronautical and Mechanical Engineering (continued)

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 6																														
ENG603	Inter-Professional Studies in Engineering	C										X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
ENG609	Individual Project (Honours)	C								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ENG619	Aerodynamics and CFD	C	X	X	X			X	X	X		X												X	X						
ENG620	Vibration Analysis and Complex Structures	C	X	X	X			X	X	X		X													X						
ENG615	Flight Stability, Control and Compressible Aerodynamics	O	X	X	X			X	X	X	X	X													X						
ENG616	Advanced Thermo-fluid and Turbomachinery	O	X	X	X			X	X	X	X	X													X						

Curriculum Matrix for BEng Aeronautical and Mechanical Manufacturing

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills														D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 4																														
ENG458	Mechanical Science	C	X	X				X	X			X																			
ENG459	Electrical Science	C	X	X				X	X			X																			
ENG460	Laboratory Methods and Materials	C	X						X			X		X	X											X	X	X			
ENG461	Engineering Mathematics	C		X					X																						
ENG462	Introduction to Engineering Design and Practice	C						X	X			X	X	X	X											X	X	X			
ENG463	Aircraft Systems	O	X					X	X				X	X	X											X	X				
ENG464	Mechanical Systems	O	X					X	X				X	X	X											X	X				
	Level 5																														
ENG536	Business and Research Development	C										X		X	X	X	X									X	X	X	X		
ENG551	Engineering and Mechanism Dynamics and Engineering Design	C	X	X	X			X	X	X		X	X	X		X	X										X	X	X		
ENG552	Structures, Failure Analysis and FEA	C	X	X	X			X	X	X		X	X																		
ENG553	Computer-based Manufacturing and Manufacturing Quality Assurance	C										X	X	X		X	X									X	X		X		
ENG554	Production and Manufacturing Strategy	C										X		X		X	X									X	X		X		
ENG555	Instrumentation and Control Systems Engineering	C	X	X	X			X	X	X		X	X																		

Curriculum Matrix for BEng Aeronautical and Mechanical Manufacturing (continued)

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 6																														
ENG603	Inter-Professional Studies in Engineering	C										X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
ENG609	Individual Project (Honours)	C								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ENG621	Modern Aircraft Materials and Technologies	C									X	X		X						X			X	X	X	X	X			X	
ENG630	Manufacturing Systems Economics and CIM	C										X	X	X		X	X	X	X	X		X	X			X	X		X	X	
ENG619	Aerodynamics and CFD	O	X	X	X			X	X	X		X												X	X						
ENG620	Vibration Analysis and Complex Structures	O	X	X	X			X	X	X		X													X						

Curriculum Matrix for MEng Performance Car Technology

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 4																														
ENG458	Mechanical Science	C	X	X				X	X			X																		
ENG459	Electrical Science	C	X	X				X	X			X																		
ENG460	Laboratory Methods and Materials	C	X						X			X		X	X											X	X	X			
ENG461	Engineering Mathematics	C		X					X																					
ENG462	Introduction to Engineering Design and Practice	C						X	X			X	X	X	X											X	X	X			
ENG464	Mechanical Systems	O	X					X	X				X	X	X											X	X				
ENG465	Performance Car Systems	O	X					X	X				X	X	X											X	X	X			
	Level 5																														
ENG536	Business and Research Development	C										X		X	X	X	X									X	X	X	X		
ENG537	Further Engineering Mathematics	C		X					X																					
ENG551	Engineering and Mechanism Dynamics and Engineering Design	C	X	X	X			X	X	X		X	X	X		X	X										X	X	X		
ENG552	Structures, Failure Analysis and FEA	C	X	X	X			X	X	X		X	X																		
ENG556	Internal Combustion Engine: Theory and Technology	C	X	X	X			X	X	X		X	X																		
ENG557	Automotive Design	C								X		X	X	X	X	X	X										X	X	X		

Curriculum Matrix for MEng Performance Car Technology (continued)

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills														D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 6																														
ENG611	Industrial Placement	C								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ENG619	Aerodynamics and CFD	C	X	X	X			X	X	X		X												X	X						
ENG620	Vibration Analysis and Complex Structures	C	X	X	X			X	X	X		X													X						
ENG631	Performance Car Chassis, Engines and Powertrains	C	X	X	X			X	X	X		X	X											X	X						
	Level 7																														
ENG715	Employability and Entrepreneurship	C										X				X				X	X	X	X			X	X	X	X	X	X
ENG717	Advanced Engineering Design and Analysis	C			X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X
ENG716	Group Design Project	C										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ENG718	Advanced Performance Car Dynamics and Control	C	X	X	X	X	X	X	X	X	X	X						X													
ENG742	Advanced and composite Materials	O			X	X	X	X	X	X	X	X	X	X		X		X	X	X		X	X							X	
ENGM70	Advanced Production and Assembly	O			X	X	X	X	X	X	X	X	X	X		X		X	X	X		X	X			X	X		X	X	X

Curriculum Matrix for BEng Performance Car Technology

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 4																														
ENG458	Mechanical Science	C	X	X				X	X			X																		
ENG459	Electrical Science	C	X	X				X	X			X																		
ENG460	Laboratory Methods and Materials	C	X						X			X		X	X											X	X	X			
ENG461	Engineering Mathematics	C		X					X																					
ENG462	Introduction to Engineering Design and Practice	C						X	X			X	X	X	X											X	X	X			
ENG464	Mechanical Systems	O	X					X	X				X	X	X											X	X				
ENG465	Performance Car Systems	O	X					X	X				X	X	X											X	X	X			
	Level 5																														
ENG536	Business and Research Development	C										X		X	X	X	X									X	X	X	X		
ENG537	Further Engineering Mathematics	C		X					X																					
ENG551	Engineering and Mechanism Dynamics and Engineering Design	C	X	X	X			X	X	X		X	X	X		X	X										X	X	X		
ENG552	Structures, Failure Analysis and FEA	C	X	X	X			X	X	X		X	X																		
ENG556	Internal Combustion Engine: Theory and Technology	C	X	X	X			X	X	X		X	X																		
ENG557	Automotive Design	C								X		X	X	X	X	X	X										X	X	X		

Curriculum Matrix for BEng Performance Car Technology (continued)

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 6																														
ENG603	Inter-Professional Studies in Engineering	C										X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
ENG609	Individual Project (Honours)	C								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ENG619	Aerodynamics and CFD	C	X	X	X			X	X	X		X												X	X						
ENG620	Vibration Analysis and Complex Structures	C	X	X	X			X	X	X		X													X						
ENG631	Performance Car Chassis, Engines and Powertrains	C	X	X	X			X	X	X		X	X											X	X						

Curriculum Matrix for BSc Motorsport Design and Management

			A. Knowledge and Understanding					B. Intellectual Skill				C. Subject and Practical Skills													D. Professional Skills and Abilities and Employability Skills and Abilities					
Module code	Title	Core / Optional	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6
	Level 6																														
ENG603	Inter-Professional Studies in Engineering	C										X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
ENG609	Individual Project (Honours)	C								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ENG619	Aerodynamics and CFD	C	X	X	X			X	X	X		X												X	X						
ENG631	Performance Car Chassis, Engines and Powertrains	C	X	X	X			X	X	X		X	X											X	X						
ENG634	Motorsport Group Project	C								X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	

Learning and teaching strategy used to enable outcomes to be achieved and demonstrated

The philosophy of the programme reflects and develops the University's mission statement and aims. The approach taken towards teaching and learning is based on a student-centred paradigm of learning designed to enable and maximise the abilities of the students to work in a wide variety of fields and disciplines within engineering. Thus, they are enabled to become independent, autonomous and reflective whilst also developing collaborative, strategic and professional capacities. They will develop and demonstrate critical analytical skills and problem-solving capabilities and the ability to be creative, pro-active and innovative. To this end, a variety of teaching and learning methods will be provided.

The learning and teaching strategy of these programmes accords fully with the University's mission statement and core values (Glyndwr University Strategic Plan 2009-2014 - http://glynfo.glyndwr.ac.uk/file.php/51/Strategies/Glyndwr-LearningAndTeachingStrategyPublic.pdf) which highlight the importance of student centeredness, respect and care for the individual, the expression of ideas and the pursuit of knowledge. The University is also committed to expanding Welsh medium provision (Strategic Theme G in GUSP 2009-14) but the Engineering Team is currently unable to deliver any of the programmes in Welsh (See section: Welsh language below).

The Engineering academic staff strive to treat their students with respect, valuing their life experience and contributions in the classroom. This is further reinforced by the Programme Team making efforts to create a learning environment where students feel safe to ask questions and take part without fear of being embarrassed and where relationships with staff are collegial and friendly. Module Tutors believe that their role is that of facilitator of learning rather than just a transmitter of knowledge which the student receives passively. To this end students are encouraged to actively engage with their learning even in 'formal' lectures by periods of group discussion, by applying themselves in both directed / self-directed study, the use of a personal portfolio and regular dialogue with their Personal Tutor, Year Tutor, and Programme Leader. Some modules [e.g.: **Inter-Professional Studies in Engineering** (L6), **Sustainable Design and Innovation** (L7), **Group Design Project** (L7)] also incorporate problem based learning and the use of technical simulation and/or role play. In such approaches problem solving and team work is emphasised; an essential competency in a Professional Engineer.

However while recognising the importance of the andragogical approach it is recognised that many students who have joined us via a widening participation strategy (Strategic Theme F in the Glyndwr University Strategic Plan 2009-2014), may not always be equipped initially to learn in this way. Module Tutors are sensitive to this need and may adapt their teaching style appropriately as well as facilitating the student to obtain help from University support services. Students early on in the programmes are encouraged to find out more about their own learning styles and work on their individual strengths and weaknesses. This is enhanced by the introduction of the University's Enterprise-based modules into years one and two, to encourage students to think about themselves as learners, develop their skills on an individual, peer and strategic level. This will subsequently contribute towards the graduates' employability status and cultivate entrepreneurial thinking [**Employability and Entrepreneurship** (L7)].

Other aspects of the educational process designed to promote active learning are tutorials, seminars, use of technology, for example setting up and contributing to online discussion forums, presentations, debates, case studies, and reflection on engineering practice. This latter aspect also demonstrates how engineering practice is *par excellence* the medium whereby students actively integrate theory and practice and is a vital component of the learning and teaching strategy.

The use of technology to enhance learning has been widely debated in pedagogic literature, but it has the potential to create more flexible approaches to learning (JISC, 2007) as well as saving on travelling costs and time. To this end, the programme team have explored and proactively used technology to enhance learning in recent years, and the programme will benefit from these experiences. The use of technology to enhance learning has been integrated into the programme across all levels and across each year, along with more traditional methods, to meet a variety of learning styles, and to enable the student to learn within a …'flexible, accessible and learner centred…' environment (WAG, 2009b. p3) as indicated in the Higher Education Strategy and Plan for Wales.

The theoretical modules are fully integrated with the engineering practice element of the programmes and give confidence that on completion the student will be well prepared to begin their new role as a Professional Engineer within their chosen field of practice. Importantly too, the educational ethos of the programmes will have prepared them as lifelong learners, well able to meet the demands of continuing professional development in the ever changing world of engineering.

Learning and Teaching are activities which operate at different levels simultaneously. To the student the immediate activity relates to the explicit topics being studied. However, other skills (transferable skills) are also inherent in order for the student to both carry out the tasks and to develop. These elements are built into the modules comprising the programmes as what might be called embedded issues. Other embedded issues, such as awareness of environmental impact and commercial implications are also included in modules throughout the programmes.

Knowledge and Understanding

Acquisition of knowledge is by means of lectures, practical and laboratory-based exercises, investigative exercises involving searching of various sources, directed reading and further reading. Pre-written notes will have a role in supporting these activities. Understanding is developed through tutorials, discussion, evaluation exercises and individual exercise sheets.

Intellectual Skills

These skills are developed by the students undertaking individual activities, within tutorials and practical sessions, or by being required to contribute to group activities. In each case, throughout the course a range of problems are set requiring the student to carry out information searches, analysis, design formulation, synthesis, test definition, modelling - by computer, methodology or by calculation - and evaluation of an implementation. Reflective self-evaluation forms part of this. Critical evaluation is encouraged via debate and discussion in the tutorials.

Subject and Practical Skills

These skills are developed by the students undertaking individual activities mainly within practical sessions. Elementary skills - such as selection and use of appropriate equipment, interpretation and presentation of results, and report writing - are developed at the earliest stage. Higher level skills which require the use of planning, simulations and evaluation culminate in the main project.

Transferable/key skills

Transferable skills include: communication skills, ability to work in a group or independently, management of time, use of computers and other technology, the application of calculations. (In fact, the discipline of regularly attending and contributing to classes exercises the transferable skills of self-management and time management.) Each module specification provides examples of transferable skills covered within its learning outcomes. Students are encouraged to write about their experiences in practice by recording them in their student portfolio. This portfolio, which also serves as a Personal Development Plan, is a repository of acquired knowledge and personal reflection and its careful completion provides a valuable learning tool throughout the programmes [**Introduction to Engineering Design and Practice** (L4), **Business and Research Development** (L5), **Industrial Placement** (L6), **Interprofessional Studies in Engineering** (L6), **Employability and Entrepreneurship** (L7)]. Information within the portfolio often helps to provide the evidence to allow the student to demonstrate competence in a learning outcome. The portfolio completion process is designed to develop critical faculties, self-awareness, problem solving, team working, autonomy, academic writing and reflective capacity (see also section on Assessment and Student Portfolio).

Industrial Placement

The Industrial Placement is an integral component of the integrated MEng degree programmes. It will normally be for 16 weeks (including statutory holiday), commencing February to May.

Although it will be the student responsibility to find his/her own placement, the University via its Careers Centre will offer significant help and support. It is anticipated that a placement officer will be appointed to be in regular contact with both students and companies/organisations.

Search for student's industrial placement will commence at the end of Level 5 in order for arrangements to be established in October. By beginning of December, students will visit their intended placement with the Module Leader or his/her Academic Supervisor and the Placement Officer to devise the project outline. The objectives of the work to be undertaken by the student will be discussed and agreed with the employer (or work placement provider), the student and the Industrial Placement Module Leader/Academic Supervisor to ensure that the work to be undertaken by the student is both of value to the employer and meets the requirements of the module learning outcomes. The objectives (learning outcomes), and the means of the student achieving them, will be articulated and formalised through a Learning Agreement agreed and signed by all stakeholders. Hence, the Module Leader/Academic Supervisor will arrange a meeting with the employer/ Industrial Supervisor and the student to discuss and agree the

following which will be monitored on a regular basis throughout the period of the student's placement.

- How the Industrial Placement module operate;
- How the placement provider will ensure that the student will have access to a working environment that enables him/her to confirm knowledge, develop skills and demonstrate competence to achieve the module learning outcomes;
- How the student will evidence appropriate work;
- The role and responsibility of the module leader in supporting the student and liaising with the employer;
- The role and responsibility of the employer/ Industrial Supervisor in supporting the student at work;
- The role and responsibility of the student in terms of achieving academic objectives and conducting themselves professionally at work.

The employer/ Industrial Supervisor's professional profile will be assessed by the Module Leader to ensure their experience is appropriate to support the student. Separate placement handbooks for employers/ Industrial Supervisor and students will be provided. Additionally, the employer/ Industrial Supervisor will be briefed by the Module Leader on the programme requirements so they will be fully prepared to provide support and guidance to the student.

During the industrial placement, the Academic Supervisor will maintain contact with the student and the employer/ Industrial Supervisor on an on-going basis according to the individual requirements of both either in person, by telephone, by e-mail, or by video conferencing. Irrespective of the amount of informal contact already made during the placement at least three formal meetings will be arranged to enable the Module Leader/Academic Supervisor along with the Placement Officer to discuss the student's progress with the employer/ Industrial Supervisor and student both on an individual and joint basis. Items for discussion at these meetings will include, but not be limited to:

- Student's progress towards previously identified objectives;
- Any additional support needs of the employer or student;
- Student's ability to apply new knowledge and skills;
- Actual benefit to the student and employer of the application of new knowledge and skills;
- Application of practical, professional and employability skills demonstrated by the student;
- Student and employer module-related documentation;

Upon completion of placement the Module Leader will be responsible for marking the assessments with contributions from the employer and will undertake a formal review of the placement with the student making use of the employer/ Industrial Supervisor feedback material. This formal review will discuss, but not be restricted to:

- Success in terms of meeting identified objectives;
- Enabling or limiting factors affecting achievement of objectives;
- Ability to apply new learning and skills at work;

- Ability to apply practical, professional and employability skills;
- Individual reflection leading to identification and definition of academic and vocational progress.

The Module Leader will be responsible for ensuring parity of student experience within the individual placement through reviewing all Learning Agreements.

In exceptional circumstances where the industrial placement has been terminated at no fault of the student, it will continue at Glyndŵr University as simulated work-based project.

Welsh Medium

Although the majority of students within the University are English speaking it is recognised that Welsh is the language of many people within Wales and some students and staff members. The University responds positively and constructively to this bilingual situation by creating a welcoming environment within which students from all cultures can interact on the basis of equality and mutual respect. Students have the right to submit assessments in the medium of Welsh; if they wish to do so they must notify the Superintendent of Examinations within two weeks of their commencement of study. The proportion of programmes that can be delivered in Welsh is 0%.

Assessment strategy used to enable outcomes to be achieved and demonstrated

Assessment within the programme has been designed to measure and develop student performance in a variety of contexts. This not only includes assessment in the context of what they have learnt (summative), but also to use assessment as a process of learning, providing the student with the opportunity to improve their performance.

Policy Guidance / University Regulations

Assessment will also ensure that standards are reached in line with Professional Body requirements (Engineering Council UK, 2011), *The Framework for Higher Education Qualifications in England, Wales and Northern Ireland* (FHEQ) (QAA, 2008) and *The Credit and Qualifications Framework for Wales* (CQFW) (WAG, 2009a). The University's regulations will also be adhered to.

All assessments will be approved by the Programme Leader, Academic Leader, and the External Examiners in line with University regulations, to ensure that each assessment is explicit in its intent, and that it is valid and reliable.

Grade related criteria will be used to assess the students' work, with feedback provided to facilitate individual and group development. All assessment will be internally and externally moderated, to ensure that assessment is fair and consistent.

Module Leaders will collate work and are responsible for presenting this at assessment boards, to enable ratification of results in line with the Universities assessment regulations. External Examiners with *due regard* will attend assessment boards and contribute to the process, to ensure external validity of assessment. Students will be informed of provisional results prior to an assessment board, and in writing following ratification of the results, with re-submission dates if needed.

Modular Assessment

Information on assessment

Students will receive information on assessment in the programme handbook, which will include the importance of, and the need to access the University regulations, difficulties that may be encountered and how to avoid/manage these (for example, plagiarism and extenuating circumstances).

Assessment will be made clear, and Module Leaders will provide assignment briefs in written (paper and electronic format) with clear links to module learning outcomes. Assessment criteria/briefs will be discussed face to face and/or in electronic format through Moodle™ (virtual learning environment), to enable the student to clarify the nature of the assessment and raise any concerns/areas for clarification.

Range of assessments

A wide range of assessment strategies have been adopted in the programmes to meet diverse learning styles and enable the students to meet modular and programme requirements, through either individual or group assessment, and students will be informed as to whether assessment is of a diagnostic, formative or summative nature.

Assessment modes include written assignments, case studies, reflective accounts, simulation, examinations (at least one unseen in year one), presentations, projects, and online collaboration/contribution. It is considered important to provide flexible approaches to assessment if the needs of students are to be met, (QAA, 2010), and the programme team have acknowledged this.

Professional body requirements have been integrated into module assessment to foster developmental progression on the programmes, with cognisance paid to how these assessments may impact upon the student's final grade achievement (see 'Assessment regulations that apply to the programme').

Support in assessment

Tutorials will be provided as group interactions, and Moodle™ will be utilised where appropriate to conduct synchronous/asynchronous discussion on assessment requirements.

Reasonable adjustments will be made in relation to student's individual needs for assessment and will be considered on an individual level by the Programme Team, whilst maintaining professional body requirements. Students who are struggling academically will be referred to the Student Support Centre, which has been of great benefit in supporting students in their studies. Depending on individual needs, various resources will be put in place and reasonable adjustments made.

Clear University policies exist, and will be adhered to for supporting students with extenuating circumstances, to enable students to engage with assessment on an equal footing with their peers, and to facilitate progression on the programme.

Improving Assessment

In addition to the role of internal and external moderation to identify areas of concern or where improvement can be introduced, module evaluations will be scrutinised for aspects relating to assessment and fed back to the Programme Team through Programme Team meetings. Staff Student Consultative committee meetings will also inform the nature and process of assessment within the programme.

Assessment point criteria and assessment

The assessments for each year have been designed to avoid overloading the student with assessments at any given time in that year (see sample of Assessment and Module duration on the following pages), to enable students to progress to the next level as far as possible, without the risk of trailing too many credits. This also allows the student to receive feedback on assessed work, and progressively develop and improve.

Assessment strategies tend to be module based but with integrated themes wherever practicable. Jointly taught modules are enhanced by correlated learning outcomes so that students are assessed within the context of their individual programme of study. The Engineering Programme Team have a long term substantial base of experience in delivering and assessing within the context of multi-disciplinary groups.

Assessment material (assignment briefs, exams, etc.) are prepared to meet particular outcomes or ranges of outcomes, internally checked for clarity and, in the case of coursework, presented to students at interactive briefing sessions. Submitted elements and complete work is assessed and feedback provided to students. Tutorials discuss group and individual on-going feedback during the course of the work set as well as on completion. Internal verification takes place before distribution of assessment material and prior to reporting of feedback and results.

The programme assessment strategy is designed to assess all relevant subject specific skills, intellectual skills and professional and employability skills. Within that basic framework, assessment is either:-

Diagnostic: Designed to provide an indicator of the learner's aptitude and preparedness for a programme of study and identify potential learning problems.
Formative: Designed to provide the student with feedback on progress and inform development.
Summative: Provide a measure of performance in relation to the learning outcomes for the module or programme.

The following learning and teaching methods are used to enable learners to achieve and demonstrate these outcomes:

Knowledge and Understanding

Assessment of Knowledge and Understanding in engineering modules is principally by means of unseen examinations at Levels 5 6, and 7, although experimentation with novel assessment methods such as portfolio preparation and presentation are being introduced. Many modules use 'in-course' assessment involving practical work or written investigative assignments. In **Introduction to Engineering Design and Practice** (L4), **Business and Research Development** (L5), **Inter-professional Studies in Engineering** (L6), in the main **Individual Project (Honours)/Dissertation or Industrial Placement** (L6), **Sustainable Design and Innovation** (L7), and **Employability and Entrepreneurship** (L7), knowledge is assessed by means of presentations and formal report writing.

Intellectual Skills

Small-scale and highly specific problems are tested by means of an unseen examination component, particularly prevalent in the mathematical and analytical modules [i.e.: **Engineering Mathematics** (L4), **Further Engineering Mathematics** (L5), **Instrumentation and Control Systems Engineering** (L5), etc]. In many modules, particularly in the **Individual Project (Honours)** (L6), and **Group Design Project** (L7) modules, larger scale design exercises are set and assessed by means of a report reflecting on the activity carried out.

Practical Skills

Assessment of practical skills is covered entirely within practical exercises and the associated reporting, particularly project-based modules. The keeping of a personal log is a key part of **Introduction to Engineering Design and Practice** (L4), **Business and Research Development** (L5), **Individual Project (Honours)/Dissertation** (L6), **Industrial Placement** (L6) and **Group Design Project** (L7) modules. In these modules, practical demonstrations are required as part of a presentation.

Transferable/key skills

Assessment for the **Introduction to Engineering Design and Practice** (L4) and **Laboratory Methods and Materials** (L4) modules is by means of a portfolio compiled by the student. In other specific modules, the assessment profile provides grading criteria based on level descriptors. These include transferable skills both implicitly and explicitly.

Assessment regulations that apply to the programme

The Bachelor Degrees, Diplomas, Certificates and Foundation Degrees regulations and Integrated Masters regulations apply to these programmes.

In considering borderline cases for the BEng(Hons)/BSc(Hons) programmes, the Assessment Board shall raise the classification to the next level if the following criteria are met:

At least 50% of the credits at Level 6 fall within the higher classification.
All Level 6 modules must have been passed at the first attempt.
In addition, the (Level 6) Individual Project (Honours) or Dissertation module must be taken into account and must fall within the higher classification.

Derogation from the Academic Regulations are approved in the following areas:

1. Pass mark of 50% for L7 modules
2. All elements of assessment to be passed with a minimum mark of 30% (Levels 4, 5, 6 & 7)
3. L7 condonement requirements to include a mark of at least 40% to be achieved in the failed modules and all assessed elements of the module have been passed at a minimum of 30%.
4. Masters classification will be determined by the following calculation: % = 50% of (Average % of all Level 7 modules) + 40% of (Average of all Level 6 modules) + 10% of (Average of all Level 5 modules)
5. Capped mark for referred L7 modules to be 50%
6. Classification borderline cases for the MEng programmes shall include consideration of:

    - At least 50% of the credits at Level 7 fall within the higher classification and this must include the Group Project module
    - All Level 7 modules must have been passed at the first attempt.
    - The Level 6 module Industrial Placement must fall within the higher classification

Programme Management

Overview

The Programme Team have vast experience in engineering education, are motivated and always aim to enhance the student experience. The Programme Leaders for each field of engineering will have currency in that field and will be supported by the Programme Team in delivering the programmes, and ensuring that the programmes run smoothly at operational level.

The Programme Team includes:

Engineering Staff			
Prof	Richard DAY	Academic Leader – Engineering	RD
Dr	Zheng CHEN	Programme Leader for: MEng/BEng(Hons) Aeronautical and Mechanical Engineering BEng(Hons) Aeronautical and Mechanical Manufacturing MEng/BEng(Hons) Performance Car Technology BSc(Hons) Motorsport Design and Management (Level 6 Top-up)	ZC
Mr	Des ADAMS	Technician/Demonstrator – Electrical and Electronic Engineering	DA
Mr	Barrie BIRMINGHAM	Senior Lecturer – Electrical and Electronic Engineering Year 3 Tutor (Electrical/Electronic + Renewable Energy) Level 6 Individual Project (Honours)/Industrial Placement Co-ordinator	BB
Mr	Nick BURDON	Technician/Demonstrator – Aeronautical and Mechanical Engineering	NB

Mr	Steve BYRNE	Senior Lecturer – Aeronautical and Mechanical Engineering	SB
Dr	Kokou DADZIE	Senior Lecturer – Aeronautical and Mechanical Engineering	KD
Mr	Olivier DURIEUX	Senior Lecturer – Automotive Engineering	OD
Dr	Richard GRANT	Principal Lecturer – Aeronautical and Mechanical Engineering Level 6 Individual Project (Honours)/Industrial Placement Co-ordinator	RG
Mr	Reg HOLME	Senior Lecturer – Electrical and Electronic Engineering Programme Leader (FdEng)	RH
Dr	Yanting HU	Senior Lecturer – Electrical and Electronic Engineering Programme Leader MSc/MRes (Electrical/Electronic and Renewable Energy)	YH
Dr	Xiaobing HUANG	Senior Lecturer – Aeronautical and Mechanical Engineering Year 2 Tutor (Aeronautical / Mechanical and Automotive)	XH
Mr	Brian KLAVENESS	Senior Lecturer – Electrical and Electronic Engineering Programme Leader – BEng(Ord) Engineering and MEng/BEng(Hons) Electrical and Electronic Engineering	BK
Mr	Phil McDONALD	Senior Technician – Aeronautical and Mechanical Engineering	PD
Dr	Ardeshir OSANLOU	Senior Lecturer – Electrical and Electronic Engineering	AO
Dr	Zhishun SHE	Reader – Electrical and Electronic Engineering Year 2 Tutor	ZS
Dr	Lishen SHI	Senior Lecturer – Electrical and Electronic Engineering	LS
Mr	David Sprake	Programme Leader - MEng/BEng(Hons) Renewable Energy and Sustainable Technologies	DS
Ms	Natalija VIDMER	Senior Lecturer – Electrical and Electronic Engineering	NA
Dr	Yuriy VAGAPOV	Senior Lecturer – Electrical and Electronic Engineering Year 1 Tutor	YV
Dr	Thuc VO	Lecturer – Composites Engineering	TV
Dr	Xiaogang YANG	Reader – Aeronautical and Mechanical Engineering Programme Leader MSc/MRes (Aeronautical / Mechanical)	XY
Dr	Zoubir ZOUAOUI	Reader – Aeronautical and Mechanical Engineering MSc/MRes Dissertation Co-ordinator	ZZ

The Programme Team meet at regular intervals to discuss items relating to the provision of the programme. Typically, items for discussion would include assessment plans/schedules, student achievement, retention, future recruitment, synchronising timing of delivery, Lab facilities/improvements/requirements, other resources, problems, special circumstances and disability issues, administration etc. Some team members usually attend University committee meetings, where some of the actions from programme meetings can be addressed.

Each module within the programmes will have a centrally located file, within which will be all documentation relating to that module. Typically this will include; module specification, scheme of work, assessment plan, assessments, internal verification for assessments, internal moderation/second marking for assessments (when completed) and archived annual monitoring reports (AMR).

The Programme Team will implement an ‘open door policy’ whereby students can access Module Leader/Module Tutor/Programme Leader without an appointment, to discuss any issues. This is in conjunction with other feedback methods.

The external examiner’s feedback and comments are discussed by the Programme Team and the response is included in the AMR which is produced by the Programme Leaders. This is formally presented to and discussed at the Engineering AMR meeting.

Programme Team Meetings

The Programme Team meeting consists of the teaching team and student representatives. This will meet at least three times per year and responds to the on-going needs of the programme as they arise, reporting directly to the Engineering Team Board when appropriate. Programme evaluation takes place continually - consistent with the University's Quality Assurance procedures. An annual evaluation report will be prepared to a standard format by the Programme Leaders at the end of each academic year.

Issues which may be discussed at the Programme Team meetings are:

- Staff Student Consultative Committee (SSCC) meetings;
- Points arising from previous Engineering Team meeting;
- Student Perception of the Courses (SPOCs);
- Student Perception of the Modules (SPOMs);
- Assessment results;
- Resources;
- AMRs.

Issues which cannot be resolved at this level are referred to the Engineering Team meetings.

The Programme Team have responsibility for:

- Implementing recruitment and induction procedures;
- Implementing equal access and equal opportunities policies;
- Effective programme design, implementation and assessment strategies;
- Implementing student support systems;
- Effective liaison with employers;
- Implementing quality control systems:
    - Monitoring the operation of the programme,
    - Monitoring student progress,
    - Implementing review and evaluation procedures.

The Programme Leader has particular responsibility for:

- The effective operation and development of the programme team;
- Identifying future resource and team development needs;
- Planning and implementing detailed review and evaluation procedures that incorporate the views of all stakeholders;
- Providing the link between the programme team, students and the external examiner;
- Student tracking and student records;
- Collation of assessment data, presentation of data at assessment boards;
- Quality assurance and annual monitoring of programme;
- Overseeing all internal verification and moderation.

Each Module Leader is responsible for:

- The maintenance and development of learning and teaching materials for all students enrolled on the module;
- The setting, marking and collation of marks for all module assessments, including re-sit assessments, and submission of student results to the Programme Leaders;
- Internal verification and moderation of the module;
- Support for students taking the module for which they are responsible;
- Quality monitoring, including processing of annual student feedback questionnaires.(i.e.: SPOMs);
- Annual monitoring report (AMR) for module.

Year Tutor:
Each level has a 'Year' Tutor, who is responsible for the day-to-day conduct of that level of the programme and, in particular, the interface with the students. Immediate issues such as organisation of tutorial groups, responding to student concerns, etc are first passed to the Year Tutor, who will then co-ordinate with the timetable coordinator and other departmental staff, including the Programme leaders to solve the problem. The Year Tutor monitors attendance during the year and co-ordinates the marks for that level of the programmes in order to monitor the progress of individuals. He/she is able to co-ordinate feedback about progress from several Tutors and can thus highlight problem students.

Each student is responsible for:
- Managing their time effectively to enable them to carry out required coursework/assignments;
- Evaluating the quality of the programme periodically as stipulated in the University's Quality Assurance procedures;
- Electing student representatives to sit on Programme Team meetings and the Staff Student Consultative Committee;
- Keeping all evidence of completed coursework securely until the programme has formally ended and been seen by the External Examiner(s)

Quality Procedures
Quality of programmes conforms to procedures set out by the Department, Institute, and University's requirements for academic quality assurance, monitoring, and review. There are a range of systems in place to make certain that the range of learning, teaching, and assessment methods is appropriate at each level of the programmes. These systems that range from peer observation to moderation have already put in place by the Programme Team. Areas of good practice across the Institute have been examined and used to influence methods in combination with the experience of the current Programme Team. The Programme Team intend to take a collaborative approach to planning, delivery, assessment and overall evaluation.
Existing arrangements for quality assurance will apply to the programme. The following annual quality assurance mechanism will operate:
- Annual Monitoring Reports (AMR) are considered at Engineering Team meetings and reviewed through Glyndŵr's Academic Programme Sub-committee;
- External Examiners Reports are formally reviewed through the AMR. A response to the report is formulated by the Programme Team and an action plan created;
- The capture and use of formal and informal student feedback and its interpretation is

embedded in the AMRs and discussed;

- A Plenary session is then held for the University to feedback on the overall quality of the AMRs;
- Module Leaders provide a module-based review of the operation, quality, and standards of individual modules;
- Informal sharing of current and best practice occurs through Programme Team meetings.

Programme Monitoring and Review

Programme monitoring and review is an on-going process involving everyone concerned with each programme. The Programme Leaders and the Programme Team will monitor the day-to-day operation with input as necessary from student representatives. The role of student representatives is detailed further in other sections. In addition, there are two formal mechanisms for dealing with programme issues - the Programme Team and Engineering Team meetings.

Changes to the Programmes through AM1/AM2 will be made from time-to-time as a result of this process. These mechanisms will ensure that there is an auditable and clear process for monitoring and review of all aspects of the programme's operation, leading to the maintenance of academic and professional standards.

Staff Student Consultative Committee (SSCC)

The SSCC is held twice a year to discuss a number of issues. Prior to the meeting an agenda is set and distributed to all participants. The meeting held with the students is minuted and actioned accordingly. Copies of the minutes are given to the class representative to disseminate the information back to the group. The points arising are then discussed at School Board and information is fed back to programme team meetings and issues minuted. If the matter cannot be resolved at this level, issues are referred to other meetings such as Engineering Team meetings or back to the Senate's sub-committees if necessary.

Within the context of the subject areas, individual team members take responsibility for cross programme issues such as marketing and recruitment, admissions, induction, retention, equal opportunities, research, timetabling, relationships with professional bodies and careers advice amongst others.

Part-time staff and colleagues from other Departments are invited to attend the Engineering Team meetings. The contribution of each part-time or sessional team member is overseen by a full-time member of staff who takes responsibility for the management of the module.

Research and Scholarly Activity Underpinning the Curriculum

Research and scholarship underpin and inform teaching and learning within the Engineering department. The staff take part in a broad range of professional development activities, including attending and presenting papers at national and international conferences, bespoke training programmes for industry, consultancy, research, and writing for publication.

The Programme Team consider it essential that research should underpin the curriculum. Knowledge and expertise gained through research and scholarly activity informs tutors' planning and is disseminated through seminars and teaching.

All full-time members of staff are involved in the Appraisal process and staff development. Appraisal takes place annually and development targets are set, some of which have been identified through the peer observation system. All staff have the opportunity to take part in Glyndŵr University staff development days and there is a small budget for individuals to attend conferences related to subject-related topics. Several module leaders are external examiners at other Institutions. Staff have membership of professional bodies related to their specialism(s) and involvement at national level in committees that keep them at the forefront of developments and policy initiatives.

Particular support for learning

Personal Support:
The student experience in engineering is extremely demanding as it involves both engagement with academic work and practical investigations in engineering laboratories/workshop, and students are encouraged to engage fully with various personnel who can support them. The Personal Tutor is vitally important in providing this support, and the Programme Team work hard to support students through this process. Each student is allocated a Personal Tutor at the beginning of the programme, has timetabled sessions to engage in this process, and will be supported in both academic and pastoral contexts. This includes the on-going discussions required as part of their personal and professional, and portfolio development.

An induction week takes place prior to the commencement of all programmes where students are given a tour of the site/facilities, industrial visits, field trips, team building exercises, a variety of events to introduce students to the social side of their life at Glyndŵr University and also to help them get to know other students. They are also informed about the programme requirements, the processes in place, such as student handbook, student guide, and Personal Tutor roles. They will also be introduced to their Personal Tutors and Module Leaders, so that expectations can be discussed from both tutor and student perspective. This includes information on the requirements for academic and practical work, for example, module timetables and teaching methods and assessment strategies/types that need to be completed such as health and safety checklists and risk assessments. Students are prepared for theoretical and practical experiences, and action is taken as far as reasonably possible to support and meet the individual needs of students, including introductions to teaching and learning resources that they will be expected to engage with, so that the learning experience can be maximised.

In addition to the pastoral role, the programme team utilise the Student Support Services proactively with students, in conjunction with the student's needs. As necessary, students can have their learning needs assessed, and the Programme Team have developed a very good relationship with the Disability Advice Service and Learning Support Team. Counselling is also available and advised depending on individual circumstance.

It is recognised that each student has different needs and will learn at a different pace. Self-directed time is built into the programme to facilitate individual learning needs, to allow students to work at the pace that suits them.

Resit/Re-assessment Summer Support Project

The Summer Support Project plays a major role in the University's retention strategy by ensuring students receive the guidance and support they need to progress to the next level of study through academic cover rotas. The project has made a positive impact for the past four years, and is important in improving student progression and continuation rates.

The project targets undergraduate and postgraduate students who, following the June assessment boards, must either re-sit exams or resubmit assignments over the summer period and / or repeat a year of study.

Students are normally directed to a Summer Support webpage via Moodle where they can:

- Access resources and information pertaining to general study skills;
- Make contact with the Academic Study Skills team;
- Retrieve assignment briefs provided to the SPC (Student Programme Centre) by Programme Teams.

To assist Programme Teams in reaching students in need of support, a Student Data Services report identifying every student facing reassessment or a repeat year are made available to them. It contains student contact details, the assessment board outcome (i.e. re-sit or repeat) and list the module(s) reassessment students must revisit.

Maths Support Centre for Engineering and Science

Glyndŵr University has been highly successful in supporting widening participation and has been effective over many years in attracting students from low income families besides part time students. As it has done so, the University has continued to face the challenge of providing a sufficiently high level of student Widening participation agenda – To recruit non-standard students support in order to achieve a strong level of student progression.

By getting an HE STEM Wales grant of £10,000, a Maths Support Centre for Engineering and Science students has been set up. Topics offered to Engineering and Science students were in-line with Level 4 and 5 syllabi. It is anticipated that the Departments will carry on delivering the Maths support and more general support using Experiential and Negotiated Learning modules, which are designed to help students in their studies but will be outside of the programmes.

The set-up of the Maths Support Centre for Engineering and Science improved student retention especially at Level 4 (None of Level 4 students withdrew from Engineering or Science programmes for Academic reasons), the performance of the less well-prepared students, and student confidence by creating an environment where students will feel that "no question is a stupid question". It also succeeded to reach the students who need this support most.

Learning resources available*:*

When students commence their studies with engineering, they are introduced to the purpose built library and computer resource within Glyndŵr University, and informed of the services available to them. Whilst containing two floors of resources, it is also an effective environment for small group and individual working.

Library and computing facilities provide the books, journals, electronic resources and up-to-date computing facilities that will support students study and research. Students have access to over 150,000 books and 300 journals and a high-speed computer network supplying a wide range of information resources and applications software, and students are increasingly being encouraged to access these resources. This academic year, The University library received £100K for non-recurrent purchases. The students and Programme Team have a direct link to the Academic Liaison Co-ordinator, which provides a dynamic forum to ensure that issues regarding educational resources are discussed and acted upon to enhance the students' experience.

The library holds books, journals, videos, DVD's and other printed materials as well as networked computers. Students can access validated, reliable and useful websites via the Glyndŵr University web page. There are approximately 200 PCs in the centre, plus IT helpdesk and wireless application is available throughout the library. The University provides a wide range of software including word processing, spreadsheet, database and presentation packages. In addition, there are printed and web-based guides available to students. Students are also able to attend workshops and seminars enabling them to make effective use of the resources available. Students are given a username and password to use the networked computers in the University. This allows for easy access to the internet and electronic mail as well as electronic information resources.

The library uses a web-based library catalogue which integrates the printed and digital library collections into a single resource. It can be accessed from any computer connected to the University network and over the web. Students are able to search for books and journals and link to a wide variety of electronic resources including databases and full text journals. Students can check their library borrowings, renew the periods of loan and reserve items which are not immediately available.

The library provides multiple copies of recommended text books which are on reading lists and in heavy demand. Books are usually for a three-week loan period. However, titles that are likely to have a high demand can be made available for one week, 24-hour and 4-hour loan periods.

The centre has a joint catalogue with the University of Wales, Bangor. The library can request books on students' behalf from the Bangor library and an inter-library loan service is also available when items are not held at either Glyndŵr University or Bangor. A charge is made for this service.

Since this academic year, staff and students can simultaneously search IEEE Xplore alongside electronic resources including:

- EBSCO ebook collection;
- Emerald;
- News Bank (for UK newspapers);

- SAGE Journals online;
- ScienceDirect;
- Web of Science.

Laboratories and Equipment (Located in C Block, E Block, and Library):

The 10 programmes are each a continuation of an existing programme so that all essential resources are already in place: rooms, laboratories, staff and equipment. There are 16 laboratory areas used by these programmes:

L100	General Computer suite.
E1	Computer/CAD/ECAD Lab (approx 16 seats total).
E1Proj	Embedded Systems Lab.
E12	Control and PLCs Lab.
E13	Electronics Workshop.
E15	Dedicated computer-automated testing (ATE) Lab.
E2e	Main electronics and electrical Lab (approx 40 seats). Plus computing (ECAD) facilities
E2p	Electrical and Electronic Lab.
E2m	Electrical machines and Power Lab.
E*	PCB etching and preparation areas.
E5	Mechanical and Thermofluid Lab.
E6	Motor vehicle workshop.
E7	Mechanical workshop.
Hangar	Aircraft Hangar.
Aero Lab	Six-axis flight simulator, Wind Tunnel, Smoke Tunnel Lab.
C36	Audio, TV, and Radio Lab.

There is a wide range of equipment from the basic to the sophisticated. This does not mean that the team members do not seek improvements. With the large student cohorts being handled, additional resources are always sought and, considering the modern technology involved in the programmes, updating is a continual pressure.

A major boost to the programmes and to the Programme Team is the recent capital investment in excess of £300K being spent in the Engineering laboratories and workshops.

Virtual Learning Environment

Extensive use is made of Glyndŵr University's VLE, Moodle™, to enhance the students' learning experience.

Moodle is used by most staff to provide information about the programmes and individual modules, and also as a repository of lecture notes, tutorial and lab sheets, videos and links to other sources of information (e.g.: professional body websites, online magazines/books).
Moodle can also be used for conducting on-line assessments and to communicate with individual students or groups. For example, we have developed several on-line quizzes, which are used for formative assessment during module delivery, as practice for formal in-course tests, and also in some cases for summative assessments, replacing traditional paper-based

examinations. These are used where appropriate to supplement the more traditional forms of assessment.

Whilst emails are utilised within the programmes, the 'Moodle' site has provided an additional efficient communication method and a valuable learning resource for the students in all cohorts. Providing a variety of learning resources facilitates maximum student potential by catering for individual learning styles. Feedback from our current students suggests that they find Moodle very useful as a learning aid and the quizzes help maintain motivation during the programme and for revision, etc.
This is particularly useful with part-time students, who only have limited access to PC's and the intranet during their attendance because of the intensive nature of their contact hours. Moodle is available virtually 24/7 from any internet enabled PC, so this allows them to preview material before attending, and review lecture and supplementary notes afterwards, as well as being able to submit work and receive feedback outside of their day-release attendance.

Use of Moodle also replaces traditional paper 'hand-outs' (in a lot of cases), meaning students cannot lose them, and are able to access them on-demand from a laptop/ipad, etc. This allows them to revisit course materials, follow up internal and external links, tutorial examples and revision notes, etc. Several e-books are available via Moodle, and there is access to a large resource of video and other materials particularly to support Mathematics and related subjects. Year Tutors and Programme Leaders also use Moodle to disseminate support materials, such as student handbooks, notices relating to the programmes, assignments, examination information and past papers, revision material, information relating to Professional Bodies, visiting lecturers, out of hours or special events, etc.

English Language Support for Non-Native English Speaker:
A Second Language Learning Centre was established in 2007. A team of English Tutors along with a Second Language Learning Manager are responsible for the delivery of general and technical English tuition across the University. The team is liaising with academic staff for the English subject specific provision.

Equality and Diversity

The admissions process adheres to Glyndŵr University's published policies on Equal Opportunities and Student Disabilities.

Ensuring all areas of the programme (including assessments) are accessible to students on the programme supports equality and inclusion. Recognising the requirements of current regulations and legislation in relation to the Equality Act 2010 all information that is produced for students will use plain language that is free from bias.

Students who present with a specific learning requirement are referred to Student Services where they can be formally assessed and the appropriate support can be implemented. The range of support that is available to individuals range from one-to-one tutor support to specialist equipment and software.