

MODULE DIRECTORY

PROGRAMME TITLES:
BSc/HND MOTORSPORT ENGINEERING
BSc/HND AUTOMOTIVE ENGINEERING

LEVEL 5

ACADEMIC DISCIPLINE OF ENGINEERING

WALES INSTITUTE OF SCIENCE & ART

2019-2020

CONTENTS PAGE

	Page No
INTRODUCTION.....	1
MODULES.....	2
Industrial Placement and Team Management.....	2
Powertrain Design & Efficiency.....	6
Mechanical Priciples.....	10
Emission Control & Diagnosis.....	13
Group Project & CAE.....	16
Data Acquisition & Dynamics.....	22

INTRODUCTION

This Module Directory includes all the modules for Level 5 within the Engineering Portfolio in the academic year 2019-2020.

This directory accompanies the Programme of Study Handbook, which will provide you with details of which modules you will be studying for your programme this year in the 'Programme of Study' section. This directory may include modules that are running on other programmes of study within your School/Faculty. If you require assistance in identifying the modules for your programme of study, please contact the Programme Director (whose name and contact details are provided in the accompanying Programme of Study Handbook), or the relevant Faculty Office.

The University has made every effort to make the information as full and as accurate as possible, but you should note that minor changes in the organisation of modules between the planning stage and the actual teaching are inevitable. We shall try to keep any such changes to a minimum, and you will receive plenty of advance warning in the event of any alteration. We would also be grateful if you would let us know about any changes that you think might be helpful if introduced into future handbooks.

MODULE CODE:	M5X02199
TITLE:	Industrial Placement and Team Management
DATED:	01/09/2016
LEVEL:	5
CREDITS:	20
JACS CODE:	N210

AIM(S)

- To introduce the student to the social and commercial context of the engineering industry in terms of business environments including: management organisation and administration, regulation and legislation, financial management and marketing.
- To build upon the experiences gained during a 6 week industrial placement that took place during the end of the first year of the programme.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

- Show detailed knowledge and understanding of the relationship between an engineering organisation and the industrial, socio-economic and environmental context in which it is found.
- Apply subject specific skills and cognitive skills in recognising and evaluating accounting methods, planning, costing and monitoring projects, workforce motivation and team dynamics.
- Develop key transferable skills in management, leadership and decision making; including self-reflection and communication skills.

INDICATIVE CONTENT

- Business organisations and the environment: types of business organisations; analysis of the organisation and its external environment; the engineering industry in the UK and global economy.
- Regulation and Legislation: product liability and contractual obligations, management of technology, protection of intellectual property.
- Business ethics: Corporate social responsibility, the engineer's responsibility to society.
- Management and Group Behaviour: management and leadership styles; management roles; management decision making and problem solving; management of change; motivation; quality management; group behaviour and dynamics; individual behaviour; personality and perception.
- Financial and Management Accounting: financial statements; cash flow; capital expenditure and revenue; cost behaviour; budgets.
- Marketing: the marketing mix; sponsorship funding models; developing a business plan for a Small Business Unit.

- Project management: Project planning techniques, project monitoring, managing risk, time management.

LEARNING AND TEACHING STRATEGY

The first part of the module will be delivered by lectures and tutorials to prepare the student to undertake a 6 week industrial placement. During the placement the student is required to take notes. During the 1st semester of the 2nd year the student is required to produce a report on the organisation and a reflective summary of the learning achieved, the report will be briefly summarised with a verbal presentation to the incoming 1st year students.

In the 2nd year individual topics will be introduced by a weekly lecture of two hours. Lectures will be supported by self-assessment exercises and/or directed study. Seminars, group discussions and workshops will be used to understand concepts and undertake practical applications such as case study analysis.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	132	66%
Placement learning	20	10%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 50%

Coursework: written report (word count 2000)

Exemplar

The students are required during studies at level 4 to identify and arrange a suitable industrial placement during the final 6 weeks of the year.

1. Your commitment, development and attitude to getting the most from your placement will be assessed through a combination of feedback from your visiting lecturer and your diary of tasks completed or carried out.
2. Your report could include any relevant diagrams or photos where appropriate. In particular you should address the following issues:
 - a. The organisational structure and size, and the nature of business of your host company.
 - b. The type of work you were involved in.
 - c. Your feelings to the values of your placement to your personal development.
 - d. Whether the placement has changed your view on the industry you chose to work in.
 - e. Whether this field of work is where you would chose to work when you complete your studies.
 - f. Whether you feel you made a positive contribution to the company.

Assessment Component 2 – 10%

Presentation: (4 minutes)

Exemplar

When you return from the summer break you will give a 4 minute presentation to the year 1 students briefly summarising where you went for your placement, what you were a part of and how you feel it will affect your future plans for employment on completion of your course.

Assessment Component 3 – 50%

Written exam to assess the students understanding of concepts and techniques (2 hours).

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	40%
Practical	10%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
Students are taught about the moral obligation companies within the industry have to be mindful of the impact their business has on the environment, on both a regional and global scale. This applies not just to how the business operates but the impact of their products too.	

BIBLIOGRAPHY

Essential

Krietner, R - *Principles of Management*. 12th Edition, (South Western College, 2012)

Maylor, H - *Project Management*. 4th Edition, (Prentice Hall, 2010)

Background

Seppala N - *Business Ethics and Corporate Social Responsibility*, (Cengage Learning, 2010)

Masterman G – *Sponsorship for a Return on Investment*, (Butterworth Heinemann , 2007)

Kotler & Armstrong - *Principles of Marketing 6th Edition*, (Prentice Hall, 2013)

Dyson, J- *Accounting for Non-accounting Students 8th Edition*, (Prentice Hall, 2010)

Mullins, L - *Management and Organisational Behaviour*, 10th Edition, (Pearson, 2013)

Chelsom et al - *Management for Engineers, Scientists and Technologists. 2nd Edition*, (Wiley, 2005)

Websites

General management: www.mindtools.com
www.businessballs.com
www.managers.com

Sustainable Business: www.edie.net/index.asp

MODULE CODE: M5X02200
TITLE: Powertrain Design & Efficiency
DATED: 01/09/2016

LEVEL: 5
CREDITS: 20

JACS CODE: H331

AIM(S)

- To allow the student to acquire in depth knowledge of a range of powertrain systems and associated technologies and their impact and function on overall vehicle design, underpinned by the engineering science fundamentals.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

- Show a detailed knowledge and understanding of the underlying principles of engine and vehicle technologies and practices for analysis complex powertrain systems.
- Demonstrate subject specific skills with respect to providing solutions using engineering principles applied to an automotive problem and the interpretation of experimental data to assess validity of solutions proposed.
- Show cognitive skills with respect to simplification and modelling of real automotive problems, the application of fundamental mechanical engineering principles and the analysis of problems and making recommendations on findings.
- Demonstrate transferable skills in problem formulation and decision making.

INDICATIVE CONTENT

- Combustions process and detonations
- Volumetric efficiency
- Engine head design
- Supercharging and Turbo-charging.
- Valve timing and engine control systems
- Intake and exhaust ports design
- Intake & Exhaust system design
- Flow bench Testing

LEARNING AND TEACHING STRATEGY

The implementation of this module is based on lectures, laboratory work and hands-on practical work in the workshop environment. Lectures and hand-outs are used to supplement the student centred learning approach used in this module. The current range of assignments in this module includes testing, measurement analysis and report writing.

Where appropriate a student may use an extra curricula project as the basis for assessment of relevant elements of the work undertaken.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 50%

Coursework: Consisting of a written report of a laboratory experiment (2000 words).

Exemplar

- 1) Carefully strip down a turbo and document the procedure. (Similar to a Haynes manual)
- 2) Describe (with pictures/sketches/cad drawings) how the flow of air and exhaust gasses flow through the turbo from atmosphere through to the tailpipe.
- 3) You are required to perform the basic design of a turbocharger installation for a V8 spark ignition four stroke engine which has a bore of 95mm and a stroke of 80mm. The engine has a rev limit of 9500 rpm. In naturally aspirated form, it has a volumetric efficiency of 85%. It is desired to run the turbocharged engine with 12 psi of boost pressure.

You should produce a report outlining: The basic principles of turbocharging.

- a) Your selection of a suitable compressor – give reasons for your choice and give supporting calculations and compressor maps with approximate boost lines drawn on.
- b) Compressor outlet temperature and intercooler calculations
- c) A summary of the installation considerations to be made – e.g. what changes will need to be made to the engine and associated systems compared to the naturally aspirated set-up.

The report should conform to standard technical report conventions and be no longer than 20 pages plus appendices.

Assessment Component 2 – 50%

Coursework: consisting of a written report of a laboratory experiment (2000 words).

Exemplar

1. Produce a critical comparison of the induction system used with a single-carburetor, multi-carburetor, single and multi-point fuel injection systems
2. Flow bench inlet and exhaust ports of standard cylinder head, at a standard pressure drop of 25" H₂O. You will be taken through a demonstration in the lab. Valid data for the assignment is supplied below.
3. Plot a graph of VOLUMETRIC FLOW RATE (VFR) (m³/sec) against L/D (valve lift / valve head diameter). Use L/D of 0.05, 0.10 ... 0.40.
4. By dividing by the valve area, plot a graph of FLOW VELOCITY (FV) (m/sec) against L/D. Use L/D of 0.05, 0.10 ... 0.40 .
5. Obtain the CO-EFICIENT OF DISCHARGE (Cd) for each L/D ratio.
Cd = VFR / Valve Flow Potential

Obtain Valve Flow Potential from P30 / 31 of the Superflow Manual (use 25" H₂O and ensure your units match and use the data for a 'Hemi').

Plot CO-EFICIENT OF DISCHARGE (Cd) against L/D

6. Now you may repeat the exercise for the modified cylinder head.
7. Produce a technical report comparing the two cylinder heads.

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
Within this module, students get to collect data and analyse it in a way which is less resource intensive than live testing of an engine. They can then use this data to develop components and further test them to investigate for improved results, also less resource intensive than multiple manufacturing of parts.	

BIBLIOGRAPHY

Essential

- Stone R - *Introduction to Internal Combustion Engines*, (Macmillan, 1999)
- Heywood J - *Internal Combustion Engine Fundamentals*, (McGraw Hill , 1989)
- Heisler H – *Vehicle and Engine Technology*, (Edward Arnold, 1985)
- Zammit S J – *Motor Vehicle Engineering Science for Technicians*, (Longman, 1987)
- Heisler H - *Advanced Engine Technology*, (Arnold, 1995)
- Martyr, M - *Engine Testing*, (Butterworth Heinmann, 1995)

Corky B – *Maximum Boost* (Bentley, 1997)

Background

Kett P W – *Motor Vehicle Science*, (Chapman & Hall, 1982)

Twigg P – *Motor Vehicle Engineers*, (Arnold, 1995)

Newton K & Steed W – *The Motor Vehicle*, (Butterworth-Heinemann, 1997)

MODULE CODE: M5X02201
TITLE: Mechanical Principles
DATED: 01/09/2016
LEVEL: 5
CREDITS: 20

JACS CODE: H300

AIM(S)

- To investigate a range of engineering mechanical principles which underpin the design and operation of mechanical engineering systems.
- To provide a firm foundation for work in engineering design and a basis for more advanced study.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

- Investigate complex loading systems, loaded beams and thin walled cylinders.
- Investigate power transmission systems and the dynamics of rotating systems.

INDICATIVE CONTENT

- Complex loading systems
 - Relationships: definition of Poisson's Ratio, typical values of Poisson's Ratio for common engineering materials
 - Two and three-dimensional loading: expressions for strain in the x, y and z-directions, calculation of changes in dimensions
 - Volumetric strain: expression for volumetric strain, calculation of volume change
 - Elastic constants: definition of Bulk Modulus, relationship between Modulus of Elasticity, Shear Modulus, Bulk Modulus and Poisson's Ratio for an elastic material
 - Buckling: buckling theory and application of Euler's equations for buckling
- Loaded beams and cylinders
 - Relationships: Slope: $i = \frac{1}{E1} \int M dx$
 - Deflection $y = \frac{1}{E1} \iint M dx dx$

- Loaded beams: simply supported beams and simple cantilevers carrying combined concentrated and uniformly distributed loads. Standard cases and Macaulay's method for deriving and integrating bending moment expression
- Stress in thin-walled pressure vessels: circumferential hoop stress and longitudinal stress in cylindrical and spherical pressure vessels subjected to internal and external pressure (e.g. compressed air receivers, boiler steam drums, submarine hulls, condenser casings), factor of safety, joint efficiency
- Power transmission
 - Belt drives: flat and v-section belts, limiting coefficient friction, limiting slack and tight side tensions, initial tension requirements, maximum power transmitted
 - Friction clutches: flat single and multi-plate clutches, conical clutches, coefficient of friction, spring force requirements, maximum power transmitted by constant wear and constant pressure theories, validity of theories
 - Gear trains: simple, compound and epicycle gear trains, velocity ratios, torque, speed and power relationships, efficiency, fixing torques
- Dynamics of rotating systems
 - Balancing: single plane and multi-plane rotating mass systems, Dalby's method for determination of out-of-balance forces and couples and the required balancing masses
 - Flywheels: angular momentum, kinetic energy, coefficient of fluctuation of speed, coefficient of fluctuation of energy, calculation of flywheel mass/dimensions to give required operating conditions

LEARNING AND TEACHING STRATEGY

Formal lectures will introduce the students to the concepts, principles and practices which will be supported by tutorials periods to allow students to apply the theory through worked examples.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 50%

Written exam (2 Hours).

Assessment Component 2 – 50%

Written exam (2 Hours).

Assessment Summary

Activity type	Percentage
Written exam	100%
Coursework	0%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	No
If yes please provide brief details (no more than 100 words):	

BIBLIOGRAPHY

Essential

Budynas R & Nisbett J - *Shigley's Mechanical Engineering Design*, (McGraw Hill, 2004)

Walter, K - *Applied Mechanics for Engineering Technology*, (Prentice Hall, 2007)

Bird J & Ross C - *Mechanical Engineering Principles*, (Newnes, 2002)

Bacon D H & Stephens R C - *Mechanical Technology*, (Butterworth Heinemann, 1998)

Background

Bolton W - *Mechanical Science*, (Wiley-Blackwell, 2006)

Hannah J & Hillier M J - *Mechanical Engineering Science* (Longman, 1999)

MODULE CODE: M5X02202
TITLE: Emission Control & Diagnosis
DATED: 01/09/20165

LEVEL: 5
CREDITS: 20

JACS CODE: H331

AIM(S)

- To develop their ability of fault diagnosis whilst considering complex techniques for vehicle systems investigation.
- To enable the student to investigate the causes and reduction of exhaust gas pollution in vehicles within the legislative framework.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

- Select suitable criteria for fault diagnosis, interpreting symptoms and repair recommendations
- Apply principles of test measurement and analysis to determine the performance of a vehicle emissions and combustion control systems whilst considering present emission legislation.

INDICATIVE CONTENT

- Fault diagnosis, interpreting, symptoms and repair recommendations
- Determine the performance of vehicle systems
- Present test results and produce a fault location guide
- Evaporation of emission control.

LEARNING AND TEACHING STRATEGY

Concepts' and 'theory' delivered through lecture periods and review of notes (handouts) supplied. Continual complementary example/application problem supportive of theory is considered, with whole class participation through interchange of ideas and discussion. Student centred examples similarly undertaken for consolidation/reflection of principles/practices already considered.

Supportive tutorial periods will focus on reviewing retrospectively work covered earlier with the aim of addressing difficulties encountered by individual students. Similarly, further application examples can be undertaken at a pace to meet individual needs (within reason).

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 50%

Coursework: Assessment of practical work and coursework to produce a report carrying a weighting of 50% to encourage engagement and focus on formative function and assess students skill on the given data to explain complex fault diagnostic techniques (2000 words).

Assessment Component 2 – 50%

Coursework: To produce a report carrying a weighting of 50% to show an ability to discuss the fundamentals of reducing pollution within the legislative framework to maintain a sustainable approach (2000 words).

Exemplar

Assignments for this module are expected to have a practical element whereby the students are expected to use engineering equipment in order to perform an experiment which explores the laws that they have been studying.

The experiment will be conducted by the students and the results collated, analysed and reported, with particular reference to the validation of the laws being investigated and with particular attention to the resolution and errors of the experimental methodology.

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
This module introduces past and present insights into how the modern industry is building a more sustainable approach for future technologies, complying to legislation and protocols whilst managing resources efficiently and effectively with the minimum impact on people or the environment. Consideration of vehicle emissions and their complex management systems encourages the learner to appreciate why consideration of sustainability is in their interest for future technologies and its impact on a global scale.	

BIBLIOGRAPHY

Essential

Halderman J - *Automotive Fuel and emissions control systems 2nd Edition*, (Prentice Hall, 2009)

Denton T – *Advanced Automotive Fault Diagnosis*, (Butterworth Heinemann, 2006)

Heywood J – *Internal Combustion Engine Fundamentals*, (McGraw Hill, 1988)

Martyr A – *Engine Testing*, (Butterworth Heinemann, 2007)

Bosch - *Bosch Automotive Handbook 9th Edition* (Bosch, 2014)

Recommended

Hillier V – *Fundamentals of Automotive Electronics, 6th Edition*, (Nelson Thornes, 2012)

Bosch - *Automotive Electrics and Electronics, 5th Edition*, (Bosch, 2007)

Background

Stewart R– *Automotive Electrical Maintenance*, (Edward Arnold, 1994)

Bennick A – *Vehicle Electronics Systems*, (Routledge, 1998)

Websites

- <http://www.aecc.be/content/pdf/131127%20AECC%20MechE%20Emissions%20from%20Euro%203%20to%20Euro%206%20LD%20vehicles.pdf>
- http://www.inrets.fr/fileadmin/ur/lte/artemis/road3/method31/Artemis_cycles_report_LTE0411.pdf
- <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:171:0001:0016:EN:PDF>

MODULE CODE: M5X02204
TITLE: Group Project & CAE
DATED: 01/09/2016

LEVEL: 5
CREDITS: 20

JACS CODE: H150

AIM(S)

- To study the principles of effective design and development and leads to a group project involving one or more of the major topic areas of the programme.
- The application of engineering principles and skills to the cost effective solution of technical problems with due regard to specification, design, cost and methods of production.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

- Plan a project, as part of a team, and to verbally present the design and development concepts and implementation stages.
- Document a design and development programme from initial concept to final realisation, including references to the project specification, research, implementation and achievements etc.
- Implement the design and development, as part of a team, and demonstrate its operation and also demonstrate an ability to produce the design on time and within budget.

INDICATIVE CONTENT

- Systematic design and development procedures (CAD & FEA)
- Research methodologies and techniques.
- Objective design and development selection.
- Project Planning.
- Cost prediction, manufacturing.
- Quality and reliability.
- Technical report writing.
- Group working and management.
- Communication skills

LEARNING AND TEACHING STRATEGY

A series of lectures will be given to cover project planning, research and group working skills. These will work to build on the analytical knowledge the students have acquired from a range of modules integral to the course to practically apply different mathematical and physical concept to a specific project. This will be in conjunction with CAE lectures focusing on further developing CAD skills initiated in year 1, and also introducing FEA for simple structures

The project requires the student to apply the knowledge and skills acquired from the lectures plus relevant knowledge gained from other programme modules. This knowledge will be applied to solve a technical design and development problem, with each member of the team having clearly defined roles to satisfy his/her contribution to the design solution.

The design and development project will commence after the first 6 hours of lectures. For the remaining part of the first term the students will primarily concentrate on research, the production of a project plan and tentative designs whilst getting the project underway. For the second and third terms students will concentrate on the implementation of the plan and achieving the project aims.

The students will work in groups of between 3 and 10. The project teams will be required to hold weekly meetings with recorded minutes, chaired by the elected student and attended by supervising staff as appropriate. The project plan will be updated as necessary to complete the project successfully.

Students will be expected to make a full contribution to the work of the group. If an individual member of the group is failing to make a satisfactory contribution to the group or is jeopardising the success of the project he or she will be counselled by the supervisor in the first instance.

If the problem persists, the student concerned will be allocated a specific element of the particular project being undertaken which will be identified by the supervisor through a detailed analysis of the project brief.

This element will contribute to the overall project submission of the group. The student will still be required to submit their work as part of the group submission and partake in group discussions and the final group presentation. The individual contribution for component 2 will also have a proportion of the mark allocated by peer review.

If a student continues failing to engage with the group then he/she shall be withdrawn from the project module with the group project being revised for the remaining students and the chair of the examining board informed.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 30%

Practical: Viva to assess the student's understanding of concepts and techniques and enable immediate feedback (9 minutes).

Exemplar

You are required to make a **verbal presentation** of your project outcomes for your group project as detailed in the module description.

The **verbal presentation** should consist of a description of the work undertaken and its contribution to the group's activities and outcomes. It should demonstrate the operation of the design implementation and explain how it developed from conception to conclusion.

Presentation

A timetable for the verbal presentations which will be put on Moodle. The presentation should take fifteen minutes and make use of PowerPoint. Around 15 slides should be sufficient.

You should talk around each slide, not read from notes. The slides can contain drawings, photographs, results, calculations etc. The slides should have bullet points where appropriate to allow you to elaborate on the points.

The first slide should include your project title and team membership

The following items need to be covered (to support the marking scheme):

- 1 Introduction -Description of scope of work – project aims.
- 2 Timing plan
- 3 Literature survey – research – references – bibliography
- 4 Experimental work
- 5 Analytical work
- 6 Modelling work
- 7 Results
- 8 Conclusions

We want to assess what you have done individually and as a group. We are assessing your technical ability, commitment, enthusiasm and how much work you have done and how well you have worked together. You need to convince us that this is your project and that it is important to you as a group. Depth, detail and focus are essential to get good marks. Remember, this is an academic project, and will be judged as such.

Literature reviews need to be academic and not just magazine references. You must acknowledge all information/data you have been given from student colleagues.

Assessment Component 2 – 20%

Practical: Viva to assess the student's understanding of concepts and techniques and enable immediate feedback (6 minutes).

Exemplar

See previous

Assessment Component 3 – 50%

Coursework: Assessment by a report submission at (2500 words).

Exemplar

The Report must be a professional account of the project. The report should start with a general introduction, overview of the project scope, planning and organisation sections which should be written by the group as a whole. Each group member should have their own section/chapter in which they detail their contributions to the project. The conclusions and project critical review should be written by the group as a whole and the entire document formatted such that it reads as a cohesive document.

A guideline format could contain as appropriate the following elements:

- Contents
- Introduction – description of project.
- Project organisation (Allocation of roles/tasks)
- Summary of the work completed / Contributions to project (individual's sections)
 - work content
 - research carried out (as applicable)
 - experiments carried out (as applicable)
 - designs carried out (as applicable).
 - development carried out (as applicable)
 - testing carried out (as applicable)
 - build carried out (as applicable)
 - analysis carried out
- Achievement and progress relative to initial project plan and timing chart
- Review of successes and failures of the project
- Bibliography of books, papers, literature supporting your work
- Appendix: Meeting minutes and other supporting information

The report must also be submitted electronically through Turnitin **by just one member** of the group. Content such as Excel spreadsheets and engineering drawings cannot be included in the electronic submission but screen dumps should be used where appropriate to add coherence to the electronic version.

Individual marks will be awarded based on the report individual sections as well as using group feedback sourced via the peer assessment method described below to indicate your involvement in the group.

Group Project Self - Peer Assessment

Self-Peer assessment is used to enable the marks awarded to better reflect an individual's contribution to the group project. The results of this exercise will be used to guide the lecturers when they are marking your contribution to the group work.

In your final presentation you will be given a form such as the one below to fill in and return.

Form

- Do not show anyone else or discuss what you have awarded your peers
- You must reflect on each of the members in your team, **including yourself**
- You must consider their contribution, performance, attitude etc to the execution of the group project
- Based on these considerations you must then award yourself and each other team member a mark from 0 to 5

Performance	Contribution	Mark
LOW PERFORMANCE	Never turns up to meetings; contributes a poor standard of work	0 - 2
AVERAGE PERFORMANCE	Turns up to meetings; contributes an average level of work	3
STUDENT EXCELS	Plays a major role in meetings; contributes exceptional work	4 - 5

Use the marking scheme above and do not be afraid to use the full range of marks for students who have not contributed or have excelled- **including yourself!** An example of the form is shown on the next page, but you will be given this form after your verbal presentation and will be asked to hand it to the faculty secretary.

Example of the Peer Assessment form

Project Group

Put **your name** in the first row and remember to also **award yourself a mark**:

Student Name	Awarded Mark

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	50%
Practical	50%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
This module demonstrates to students the resources (time/energy/materials/money) saved in computer aided design and simulation, when compared with manufacture and live testing.	

BIBLIOGRAPHY

Essential

Maylar H - *Project Management*, (Prentice Hall, 2006)

Cole GA - *Management Theory and Practice, 6th Edition*, (Thomson, 2004)

Recommended

Mullins, L - *Management and Organisational Behaviour, 6th Edition*, (Prentice Hall, 2001)

Bosch - *Bosch Automotive Handbook, 7th Edition*, (Bosch, 2007)

Moon, J - *Achieving Success Through Academic Assertiveness; Real Life Strategies for Today's Students*, (Routledge, 2009)

MODULE CODE: M5X02205
TITLE: Data Acquisition & Dynamics
DATED: 01/09/2016

LEVEL: 5
CREDITS: 20

JACS CODE: H990

AIM(S)

- To develop an understanding of the factors affecting the dynamic performance of a competition car suspension system, enabling the development of handling characteristics to be undertaken.
- To develop the ability to utilise data acquisition and analysis techniques to measure and characterise vehicle handling performance

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

- Measure static vehicle parameters to a suitable level of accuracy to enable valid wheel load and hence vehicle balance predictions to be made.
- Quantify and predict the result of suspension changes on wheel load distribution and hence a car's handling balance.
- Collect and analyse data from a simulator session or track test to measure dynamic parameters and verify predicted loads and handling balance

INDICATIVE CONTENT

- Roll stiffness distribution changes using springs and anti-roll bars
- Weight transfer due to unsprung mass, Sprung mass at roll centre height and Sprung mass acting about roll centre axis,
- Determination of body roll angle,
- Force producing lateral acceleration.
- Tyre performance characteristics.
- Influence of load distribution on handling balance
- Data acquisition use and operation
- Data analysis software for vehicle performance analysis

LEARNING AND TEACHING STRATEGY

Lectures will introduce the students to the concepts, principles and practices. Workshop sessions and use of data analysis software will develop the skills needed to calculate and validate vehicle handling predictions.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	60	30%
Independent learning	140	70%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 70%

Coursework (2500 words).

Assessment Component 2 – 30%

Written exam covering the determination of individual wheel loads and the resulting handling balance generated (2 hours).

Assessment Summary

Activity type	Percentage
Written exam	30%
Coursework	70%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	No
If yes please provide brief details (no more than 100 words):	

BIBLIOGRAPHY

Essential

Heisler H - *Advanced Vehicle Technology*, 2nd Edition (SAE, 2002)

Milliken, WF & Milliken, DL - *Race Car Vehicle Dynamics*, (SAE,2014)

Rowley, W - *An Introduction to Race Car Engineering*, 3rd Edition, (Rowley Race Dynamics, 2006)

Smith, C - *Tune to Win*, (Motorbooks International, 2004)

Smith, C - *Engineer to Win* (Motorbooks International, 2004)

Staniforth, A - *Competition Car Suspension, 4th Edition*, (Haynes, 2006)

Dixon, JC *Tyres, Suspension and Handling, 2nd Edition*, (SAE, 1996)

Background

Gillespie, TD - *Fundamentals of Vehicle Dynamics, 2nd Edition*, (SAE, 1992)

ISO 4138 (2012) *Road Vehicle Steady State Test Procedure*

Bastow, D et al - *Car Suspension and Handling, 4th Edition*, (SAE, 2004)

Haney, P - *The Racing & High Performance Tyre*, (TV Motorsports, 2003)

Weighell, P - *Shortcut to Success Racecar Engineering*, (BCS, The Chartered Institute for IT, 2006)

Smith, S - *Steve Smith's Trackside Chassis Tuning Guide*, (Autosports, 2000)

Journals

Racecar Engineering

Race Technology Magazine

Websites

www.motec.com:

<http://www.hotrod.com/how-to/chassis-suspension/ctrp-0609-asphalt-handling-problems/>