

<b>Module Title:</b>	Applied Engineering	<b>Level:</b>	5	<b>Credit Value:</b>	20
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<b>Module code:</b>	ENG545	<b>Is this a new module?</b>	No	<b>Code of module being replaced:</b>	
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<b>Cost Centre:</b>	GAME	<b>JACS3 code:</b>	H300
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<b>Trimester(s) in which to be offered:</b>	1, 2 & 3	<b>With effect from:</b>	September 16
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<b>School:</b>	Applied Science, Computing & Engineering	<b>Module Leader:</b>	Bobby Manesh
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Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
<b>Module duration (total hours)</b>	200 hrs

<b>Programme(s) in which to be offered</b>	Core	Option
FdEng Industrial Engineering	<input type="checkbox"/>	<input checked="" type="checkbox"/>

<b>Pre-requisites</b>
None

<b>Derogations</b>
A derogation from regulations has been approved for this module which means that whilst the pass mark is 40%, each element of assessment requires a minimum mark of 30% for the module to be passed overall.

Office use only

Initial approval June 16

APSC approval of modification *Enter date of approval*

Have any derogations received SQC approval?

Version 1

Yes  No

**Module Aims**

To develop understanding and an overall appreciation of the knowledge and processes that lead to developing appropriate pneumatic systems and hydraulic systems to be used in industrial control and mechanical applications. In conjunction with modern machine shop practices and equipment.

**Intended Learning Outcomes**

Key skills for employability

- KS1 Written, oral and media communication skills
- KS2 Leadership, team working and networking skills
- KS3 Opportunity, creativity and problem solving skills
- KS4 Information technology skills and digital literacy
- KS5 Information management skills
- KS6 Research skills
- KS7 Intercultural and sustainability skills
- KS8 Career management skills
- KS9 Learning to learn (managing personal and professional development, self-management)
- KS10 Numeracy

At the end of this module, students will be able to

Key Skills

At the end of this module, students will be able to		Key Skills	
1	Explain the operation principles of hydraulic and pneumatic systems and individual components.	KS1	KS6
		KS3	KS9
		KS4/5	KS10
2	Analyse the performances of hydraulic and pneumatic systems and components.	KS1	KS6
		KS3	KS9
		KS4/5	KS10
3	Demonstrate skills and knowledge in fault detection in hydraulic and pneumatic system.	KS1	KS6
		KS3	KS9
		KS4	KS10
4	Possess the ability to 'set up' machines and work pieces ready for a particular machining process –typically either, lathe turning, milling, CNC, 3D printing etc. and produce a finished machined product to given specifications.	KS1	KS9
		KS3	KS10
		KS4	
		KS6	

**Assessment:**

Assessment is 100% in-course. The assessment is based on a range of system analysis, design, practical lab-works/machining and investigations presented as a typically as two portfolios to cover 1-4. For example, there could be two major design exercises, or investigations, or system performance analyses; one for pneumatic systems and one for hydraulic systems or a mixture of both.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1-4	Portfolio	50%		2000
2	1-4	Portfolio	50%		2000

**Learning and Teaching Strategies:**

The module will be presented to students through a specified series of lectures assisted by notes given to students. Demonstrations will also be arranged to show the operation and set up of a pneumatic and hydraulic systems and the students are expected to carry out their own designs. Where possible, site visits to local industries will be arranged to demonstrate actual system operations or via video footage. In addition or in replacement of the assignments will in part be related to the student's workplace, if applicable. Safety and procedures will take place before undertaking machining, which will be delivered using tutorial sessions in the machine shop. Relevant videos will also be used to aid the learning process. Practical assignment exercises will be devised to enhance the students' learning

**Syllabus outline:**

- Fluid mechanics: Fluid pressure and measurement, Pascal's law, Temperature and measurement, Gas laws (Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined and idea gas laws), Fluid flow, Flow measurement, transmission of power by pipelines, Fluid frictions;
- Hydraulics: Principle and operation of individual components within typical systems (pumps and pressure regulation, control valves, linear and rotary actuators, reservoirs, accumulators, heat exchangers, etc.). Principle and operation of complete hydraulic systems. The arrangement of the components to enable specific functions to be carried out. Hydraulic circuit design. System performance analysis;
- Pneumatics: Air compressors, air treatment and ancillaries. Principle and operation of individual components within typical systems (compressor and pressure regulation, Control valves, Actuators, I-P converters, P-I converters, etc.). Principle and operation of complete pneumatic systems. Pneumatic circuit design. Performance analyses for individual components and system operations; Fault detection: Failure modes and FMEA (failure mode and effect analysis). Measurements for fault detection. Fault detection instruments and built-in-test equipment. Fault detection process. Maintenance of hydraulic and pneumatic systems.

- Typical machining process which could include 3D printing, CNC machining, including programming methods and code (close links with CAD/CAM module), further machining, could include lathe setup and turning, screws and threads, milling, etc.

**Bibliography:**

**Essential reading**

Parr, A. (2011) *Hydraulics and Pneumatics: A Technician's and Engineer's Guide*, Butterworth-Heinemann

**Other indicative reading**

Singal, R.K. et al. (2009) *Hydraulic Machines: Fluid Machinery*, I K International  
Stacey, C. (1998) *Practical Pneumatics*, Newnes

Tom Lipton (2009) *Metalworking*, Industrial Press inc.

El Wakil, Sherif D. [Processes and Design for Manufacturing](#), 2nd ed., Boston: PWS Publishing Company, 1998.

Ostwald, P.F. and J. Munoz, [Manufacturing Processes and Systems](#), 9th ed., New York: John Wiley & Sons, 1997.

S.C. Black, et al., [Principles of Engineering Manufacture](#), 3rd ed., London: Arnold, 1996