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| Module Title: | Agricultural Design and Mechanisation |
| Language of Instruction: | English |
| Credits: | 10 |
| NFQ Level: | 6 |
| Module Delivered In | 2 programme(s) |
| Teaching & Learning Strategies: | Lectures, laboratories, demonstrations, research, project work and some study will be used to ensure the student has a wide range of experiences. |
| Module Aim: | The aim of this module is to provide students with an introduction to manufacturing processes, the design process, manufacture of components to ISO Standards and the inherently safe design and operation of agricultural machines. |
| Learning Outcomes | |
| <i>On successful completion of this module the learner should be able to:</i> | |
| LO1 | Explain and illustrate how engines and motors (diesel, petrol, electric, hydraulic) work, the energy characteristics of different agricultural equipment and the influence of soil conditions on their operation and maintenance requirements. |
| LO2 | Demonstrate a knowledge and understanding of the wide range of agricultural machinery on the market. This should include machinery used for conventional and conservation agricultural practices and that used in livestock systems. Students will be expected to critique the energy consumption of various agricultural practices and how to reduce this consumption. |
| LO3 | Demonstrate an understanding of the design, manufacture and repair of agricultural components, assemblies and machinery in a workshop environment, ensuring compliance with ISO standards, risk assessment & reduction procedures and CE certification process. |
| LO4 | Demonstrate an understanding of the various regulations governing the operation and maintenance of farm machinery, both on the farm and on public roads, with special attention to Health and Safety Regulations. |
| LO5 | Apply and solve formulae involving the concepts of direct stress, Modulus of Elasticity, shear stress, torsion, Modulus of Rigidity, torque and power transmission and their applications within in agricultural engineering, such as torsion in solid and hollow shafts, in belt drives, couplings, keyways and gears. |
| LO6 | Demonstrate a practical understanding of the Health and Safety Aspects of agricultural machinery operation, maintenance and repair. Students will have the ability to conduct a Health and Safety audit of farm sites, equipment and machinery. |
| Pre-requisite learning | |
| Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i> | |
| No recommendations listed | |
| Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i> | |
| No incompatible modules listed | |
| Co-requisite Modules | |
| No Co-requisite modules listed | |
| Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i> | |
| CAD 1 or equivalent | |

Module Content & Assessment

Indicative Content

Understanding how machinery works

- Understanding how diesel and petrol engines, electric motors, hydraulic systems work, their energy requirements and how they are maintained.

Farm machinery types

- Understanding the machinery types associated with different streams of agriculture including tillage, dairy, dry stock, pigs and poultry

Regulations governing Farm Machinery design, manufacture and repair

- Introduce the learners to the subject of health and safety regulations regarding farm machinery operation.
- Identification of hazards and dangers in the engineering and farm industry environment.
- Machine guarding.
- Health & Safety - Employer and employee responsibilities.
- Understand the procedures for conducting a risk assessment of a new piece or modified piece of machinery, Machinery Directive and International Standards of machine design
- Fire extinguishers types and operation.

Metrology

Use of Vernier callipers, micrometres, height gauges, depth gauges, dial test indicators.

Fabrication and Assembly

- Design of components.
- Interpretation of drawings.
- Jointing methods.
- Permanent joints e.g. riveting, soldering, brazing, silver soldering, gas welding, manual metal arc welding, adhesive bonding.
- Semi-permanent joints e.g. locking devices, screwed fastenings, keys, dowels and circlips

Machine tools and accessories

- Introduction and safe operation of drilling machines, centre lathes, and milling machines.

Shear and Torsion

Modulus of elasticity. • Application to compound sections. • Shear stress and shear strain. • Modulus of Rigidity. • Torsion in solid and hollow shafts: Relationship between torque, shear stress, polar second moment of area, angle of twist. • Drive shaft configurations, cardinal shafts, balancing effect and coupling arrangements. • Power Transmission.

| Assessment Breakdown | % |
|-----------------------|--------|
| Continuous Assessment | 40.00% |
| Project | 10.00% |
| Practical | 50.00% |

Continuous Assessment

| Assessment Type | Assessment Description | Outcome addressed | % of total | Assessment Date |
|-----------------|---|-------------------|------------|-------------------|
| Written Report | Risk Assessment and Mitigation, Inherently Safe Design and Design Process | 3,4,6 | 20.00 | Every Second Week |
| Examination | Class Test | 1,2,5 | 20.00 | Week 11 |

Project

| Assessment Type | Assessment Description | Outcome addressed | % of total | Assessment Date |
|-----------------|-------------------------------|-------------------|------------|-----------------|
| Project | Practical Workshop Assessment | 1,2,3,6 | 10.00 | Week 12 |

Practical

| Assessment Type | Assessment Description | Outcome addressed | % of total | Assessment Date |
|-----------------------------|--|-------------------|------------|-----------------|
| Practical/Skills Evaluation | Mechanical workshop design & fabrication projects. | 3,6 | 50.00 | Every Week |

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

Module Workload

| Workload: Full Time | | |
|----------------------------|-----------------------|--|
| <i>Workload Type</i> | <i>Frequency</i> | <i>Average Weekly Learner Workload</i> |
| Lecture | 12 Weeks per Stage | 2.00 |
| Laboratory | 12 Weeks per Stage | 3.00 |
| Lab/Lecture | 12 Weeks per Stage | 1.00 |
| Independent Learning | 15 Weeks per Stage | 11.07 |
| Total Hours | | 238.00 |

Module Delivered In

| Programme Code | Programme | Semester | Delivery |
|----------------|---|----------|-----------|
| CW_EFARG_B | Bachelor of Engineering (Honours) in Agricultural Systems Engineering | 2 | Mandatory |
| CW_EFARG_D | Bachelor of Engineering in Agricultural Systems Engineering | 2 | Mandatory |