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| Full Title: | Pollution Control in the Agri-Food Sector |
| Module Code: | AGRI S8017 |
| Credits: | 7.5 |
| Valid From: | Semester 1 - 2016/17 (September 2016) |
| Module Delivered in | 1 programme(s) |
| Module Description: | The aims of this module are to provide students with knowledge of the fundamental principles agricultural waste management, with particular emphasis on organic wastes generation, control and alternative options for its future effective management. In addition, an interactive learning environment will be created to encourage students to develop an appreciation of alternative agricultural waste management systems and techniques. This module offers a combination of interactive practical classes, field trips and lectures that will cater for a wide range of cognitive abilities on topics that are highly relevant today, owing to the recent implementation of the Water Framework Directive (2000/60/EC), Nitrates Directive (91/676/EEC), Waste Directive (75/442/EEC) and associated Landfill Directive (99/31/EC) and will be relevant to the future Soil Framework Directive. |
| Learning Outcomes: | |
| <i>On successful completion of this module the learner should be able to</i> | |
| <ol style="list-style-type: none"> 1. Compare, contrast and evaluate various agricultural waste classes in terms of their chemical composition and variability. 2. Identify and synthesise the impact of rainwater harvesting and dirty water control on the efficiency of farmyard management in terms of meeting the requirements of various EU and global legislations. 3. Develop an appreciation of the fundamental factors that affect soil hydrology, nutrient storage and the movement of nutrients through a soil profile and their possible impact on surface / groundwater contamination. 4. Critically evaluate the use of natural treatment processes as alternative agricultural waste management options. 5. Investigate, appraise and constructively criticise complementary and novel waste treatment technologies to effectively deal with apposite quantities of agricultural wastes generated, keeping in accordance with relevant legislations. 6. Perform lab practicals effectively and efficiently and demonstrate an appreciation of the relationship between the scientific content of the various practicals and their application in the field. | |

Module Content & Assessment

| Indicative Content |
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| <p>Agricultural waste classes Manure storage (farmyard, dairy industries, abattoir, outwintering pads, pig, poultry, mushroom, equine wastes); manure storage capacity; liquid manure; silage effluent; solid manure storage (design and location). Agrichemical wastes; pesticide and herbicide use, control and management; effects on water systems; ecotoxicology. Management, recycling and treatment options for farm plastic, scrap metal, tyres, used oil, oil filters and engine batteries. Implications of various contaminants on climate change.</p> |
| <p>Natural treatment processes Integrated constructed wetlands; nutrient control; site assessment; hydraulic resistance times; nutrient cycling, retention and retrieval. Reed bed systems; construction and nutrient retention.</p> |
| <p>Bioremediation: Principles and applications Application of agri wastes and biosolids to land and contaminated sites; linking phytoremediation, bioremediation (through plants and bacteria), phytoprotection, carbon sequestration and nutrient cycling. Review of technologies associated with using carbon filters, sand filters and organic wastes as filters in treating various agricultural wastewater streams.</p> |
| <p>Traditional and conventional waste treatment technologies Management of diffuse pollution (organic and agrochemical sources) from land spreading (soil hydrology, nutrient storage in soil); buffer strips; fencing; commercial systems, habitat biodiversity recovery; nutrient management planning. Attitudes and public perceptions of traditional and conventional waste treatment technologies.</p> |
| <p>Innovative waste treatment technologies Overview of other alternative waste management options (bioenergy). Technologies for slurry separation; decanter centrifuge systems; Options for pelleting liquid wastes. Review of other available commercial systems for treating wastewater e.g. Hydrointernational.</p> |
| <p>Integrated approach waste management Inclusion of alternative energy options such as wind, hydro and geothermal energy in waste management. Rainwater harvesting technologies and its impact on the efficiency of farmyard dirty water control. Impacts of agricultural waste management on various legislations including carbon dynamics as addressed under the Kyoto Protocol.</p> |
| <p>Laboratory practicals Waste analysis and characterization; Slurry separation using decanter centrifuge systems; In-situ trials on surface run-off using lysimeters; Chemical and biological analysis of integrated constructed wetlands; Composting trials, using Slovita maturity test-kit to determine compost maturity; Phytotoxicity of various wastes using germination index tests.</p> |
| <p>Field site visits 1. Rainwater harvesting pilot project 2. Integrated constructed wetlands 3. Constructed wetlands at Lakeland Dairies; 4. Local authority reed bed systems; 5. Decanter slurry system / slurry pelleting system.</p> |

| Assessment Breakdown | % |
|----------------------------------|--------|
| Course Work | 40.00% |
| End of Module Formal Examination | 60.00% |

Full Time

| Course Work | | | | | | | |
|-----------------------------|---|-------------------|------------|--------------|------------|-----------------|----------|
| Assessment Type | Assessment Description | Outcome addressed | % of total | Marks Out Of | Pass Marks | Assessment Date | Duration |
| Practical/Skills Evaluation | Waste analysis and characterization; Slurry separation using decanter centrifuge systems; In-situ trials on surface run-off using lysimeters; Chemical and biological analysis of integrated constructed wetlands; Composting trials, using Slovita maturity test-kit to determine compost maturity; Phytotoxicity of various wastes using germination index tests. | 1,4,6 | 30.00 | 0 | 0 | Every Week | 0 |
| Group Project | (Site visits) including; Rainwater harvesting pilot project, Integrated constructed wetlands, Constructed wetlands at Lakeland Dairies, Local authority reed bed systems, Decanter slurry system / slurry pelleting system (feasibility, sustainability and financial implications) | 1,2,3,5 | 10.00 | 0 | 0 | Week 10 | 0 |

No Project

No Practical

End of Module Formal Examination

| <i>Assessment Type</i> | <i>Assessment Description</i> | <i>Outcome addressed</i> | <i>% of total</i> | <i>Marks Out Of</i> | <i>Pass Marks</i> | <i>Assessment Date</i> | <i>Duration</i> |
|------------------------|-----------------------------------|--------------------------|-------------------|---------------------|-------------------|------------------------|-----------------|
| Formal Exam | End-of-Semester Final Examination | 2,3,4,5 | 60.00 | 0 | 0 | End-of-Semester | 0 |

Reassessment Requirement

A repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

DKIT reserves the right to alter the nature and timings of assessment

Module Workload & Resources

Workload: Full Time

| Workload Type | Workload Description | Hours | Frequency | Average Weekly Learner Workload |
|-------------------------------|--|-------|------------|---------------------------------|
| Lecture | Lecture | 3.00 | Every Week | 3.00 |
| Practical | Laboratory practicals | 3.00 | Every Week | 3.00 |
| Independent Study | Laboratory practical write up, group assignment and independent study | 5.00 | Every Week | 5.00 |
| Directed Reading | Direct reading on relevent topics covered during class and site visits | 2.00 | Every Week | 2.00 |
| Total Weekly Learner Workload | | | | 13.00 |
| Total Weekly Contact Hours | | | | 6.00 |

This course has no Part Time workload.

| Resources |
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| <i>Recommended Book Resources</i> |
| <p>Ashworth, G.S. and Azevedo, P 2009, <i>Agricultural Wastes</i>, 1st Ed., Nova Science Publishers Inc [ISBN: 1607413051]</p> <p>Kulakow, P.A. and Pidlisnyuk, V.V 2009, <i>Application of Phytotechnologies for Cleanup of Industrial, Agricultural and Wastewater Contamination</i>, 1st Ed., Springer [ISBN: 9048135907]</p> <p>Insam, H. , Franke-Whittle, I and Goberna, M 2009, <i>Microbes at Work: From Wastes to Resources</i>, 1st Ed., Springer [ISBN: 364204042X]</p> <p>Scragg, A 2005, <i>Environmental Biotechnology.</i>, 2nd Ed., Oxford University Press [ISBN: 0199268673]</p> <p>Williams, P.T 2005, <i>Waste Treatment and Disposal.</i>, 2nd Ed., J. Wiley & Sons [ISBN: 0470849134]</p> <p>Epstein, E 1996, <i>The Science of Composting</i>, 1st Ed., CRC Press [ISBN: 1566764785]</p> <p>Rita Cestti, Jitendra P. Srivastava, Samira Jung 2003, <i>Agriculture Nonpoint Source Pollution Control</i>, The World Bank, Washington DC [ISBN: 0821355236]</p> <p>Ronald E. Hester, Roy M. Harrison 2012, <i>Environmental Impacts of Modern Agriculture</i>, RSC publishing [ISBN: 9781849733854]</p> |
| <i>Recommended Article/Paper Resources</i> |
| <p>European Union 2009, <i>European Communities (Good Agricultural Practice for Protection of waters) Regulations 2009</i>, S.I. No. 101 of 2009</p> <p>European Union 2001, <i>Waste Management Act</i>, S.I. No. 10 of 1996, S.I. No. 36 of 2001</p> <p>European Union 1999, <i>Council Directive 99/31/EC on the landfill of waste.</i></p> <p>European Union 1996, <i>The Integrated Pollution Prevention Control Directive (96/61/EC)</i></p> |
| <i>Other Resources</i> |
| <p>Website: <i>Environmental Protection Agency</i> http://www.epa.ie</p> <p>Website: <i>Teagasc</i> http://www.teagasc.ie</p> <p>Website: <i>Soil Science Society of Ireland</i> http://www.ucd.ie/ssi/Home.html</p> <p>Website: <i>Water Framework Directive</i> http://www.wfdireland.ie/</p> <p>Website: <i>Department of Agriculture, Fisheries and Food</i> http://www.agriculture.gov.ie/</p> <p>Website: <i>Forfas</i> http://www.forfas.ie/</p> <p>Link: <i>Library Catalogue</i> http://tinyurl.com/l5vw478</p> |

Module Delivered in

| Programme Code | Programme | Semester | Delivery |
|----------------|---|----------|-----------|
| DK_SFOAB_8 | Bachelor of Science (Honours) in Food and Agri Business | 1 | Mandatory |