Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

GA_ESETG_H08

Bachelor of Science (Honours) in Sustainable Engineering Technologies

Programme Documentation

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Atlantic Technological University

GA_ESETG_H08 2023
Bachelor of Science (Honours) in Sustainable Engineering Technologies

Programme Overview

Full Title	Bachelor of Science (Honours) in Sustainable Engineering Technologies		
Status	Approved by Academic Council	**Programme Code**	GA_ESETG_H08
Level	08	**Required Credits**	240
Delivered By	Stage	**Minimum Duration**	4
Start Term	2023	**ISCED Code**	0712 - Environmental protection tech
Award Class	Honours Degree Ab-initio	**Award Type**	Bachelor of Science (Honours)
Award Standard	Engineering	**Department**	Mechanical & Industrial Eng
Delivery Mode(s)	Full Time		

Programme Authors

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Aim

The overall aim of this programme is to provide graduates with the knowledge, skills, and competencies in sustainable engineering technologies that will allow them to lead an organisation in addressing the Sustainable Development Goals. The objectives of the programme are to:

1. Provide a critical awareness of the complex social, economic, and environmental challenges facing society and the inter-relatedness of these challenges;
2. Develop strategic, critical and systems thinking competencies to embed sustainability technologies into organisational practices and decisions;
3. Provide the knowledge and skills to understand environmental, social, and economic impacts and develop evidence based, transparent sustainability monitoring and reporting;
4. Collaborate with internal and external stakeholders to lead transformational change;
5. Provide an opportunity to apply sustainability concepts and frameworks to their professional context.

Entry Requirements and Access Routes

This tertiary education programme aims to increase access to degree level education in a number of ways including increasing the number of locations regionally that students can begin their studies, enhancing flexibility through providing a number of programme paths, widening access through more flexible entry requirements which take account of the socio-economic and other barriers faced by the target group. Leaving Certificate requirements are lower than those which typically apply for entry to an ATU degree, and as applications are direct to the ETB remove Leaving Certificate points as a requirement. Applicants meeting minimum requirements will be interviewed by the ETBs to allow for assessment of aptitude and motivation, considering the barriers faced by candidates to accessing tertiary education through other more conventional routes.All students who are not native English speakers,must meet minimum English Language requirements:–CERFLproficiency at B2, IELTS with and average score of 6.0 and a minimum of 5.5 in each band or equivalent.See end of section for further details.All European Union and European Economic area (EU/ EEA) citizens, and persons who do not already hold a 3rdlevel qualification equal to or higher than the award with designated International Protection status can access these programmes. Applicants outside of the EU must meet all the visa requirements of the State before enrolling on the course. It will be the applicant's responsibility that they engage with the relevant agencies in relation to visa requirements.

Entry Requirements:

All applicants must a minimum of 17 years of age.

- Leaving Certificate-Grade O6/H7 or better in five Leaving Certificate subjects including Mathematics. Leaving Certificate must include English or Irish. Irish at F2 is acceptable to meet the minimum language requirements.

OR•

- A Full level 5/6 QQI award which includes 5N1833, 6N3395, 5N18396, 5N0556 or 5S2246 or LCE Maths.

OR

- Mature applicants -(aged 23 on or before 1st January of the course commencement year). These applicants do not have to meet the minimum entry requirements listed here and are considered on an individual basis (previous education, work experience, and demonstration of competence to undertake the programme)

OR

- QQI FET Foundation Certificate or Joint ATU/NUI Galway Foundation Certificates or Certificate in Access for Higher Education or equivalent.

OR

- An applicant who is a minimum of 17 years of age with at least 2 years post Junior Certificate relevant experience. All applicants must demonstrate that they would qualify for the special rate of maintenance grant under the Student Grant Scheme (SUSI) and/or are in receipt of a Department of Social Protection (DSP) long-term means-tested social welfare payment and/or be from one or more of the priority groups or from any priority group identified as part of the next National Access Plan (2022-2028). Applicants must demonstrate competence to undertake the programme including an equivalence to an O6/H7 in LCE Maths.

Selection Process

ATU, Donegal ETB, Mayo Sligo Leitrim ETB, Galway Roscommon ETB, are centres for learning committed to providing education and training to the highest standards. The programmes we offer are student centred and provided in a friendly, inclusive, and supportive environment. We aim to have students enrolled across all our programmes which reflect the diversity and social mix of Ireland's population.The selection criteria are based on the principle of equality. ATU and the ETBs do not discriminate on any of the grounds outlined in the Equal Status Act 2000-2015.Accordingly, we shall not discriminate in its admission of a learner based on the following grounds.

1. Gender of the Student or Applicant
2. Civil Status of the Student or Applicant
3. Family status of the Student or Applicant
4. Sexual Orientation of the Student or Applicant
5. Religion of the Student or Applicant
6. Disability of the Student or Applicant
7. Race of the Student or Applicant
8. Membership of the Traveller Community or Roma Community of the Student or Applicant
9. Socio –Economic status of the Student or Applicant
10. Age of the Student or Applicant once they are over 17 years of age.

We will take note of the current Government policy in terms of widening participation in Further and Higher Education when selecting applicants for the new programmes. The current HEA, National Access Plan 2022 to 2028, identifies three main groups who are underrepresented in higher education:

➢Students who 1) are socioeconomically disadvantaged; 2) are members of Irish Traveller and Roma communities and 3) have disabilities including intellectual disabilities.We recognise that students experiencing such disadvantage may come from various backgrounds including:

- ➢Students from low-income families and/or who are long-term social welfare dependent.
- ➢Students from socioeconomically disadvantaged areas
- ➢Students who are mature and who previously attended higher education but did not complete a course (that is, 'second chance' mature students)
- ➢Students who are lone parents or teen parents
- ➢Students who are migrants or refugees or who have experience of the international protection process, or students from ethnic minorities -who do not currently hold a 3rdlevel qualification equal to or higher than the award offered
- ➢Students who have experience of the care system
- ➢Students who are survivors of domestic violence
- ➢Students who are carers
- ➢Students who have experienced homelessness
- ➢Students who have experience of the criminal justice system
- ➢Students who are members of Irish Traveller and Roma communities
- ➢Students with disabilities including intellectual disabilities.

Selection Process

Admission to a particular course will be assessed through an application form and an interview. Each ETB will arrange interviews for all eligible applications received by the closing date. Late applicants will be put on a waiting list to be considered if places remain unfilled following the initial admissions process. A common marking scheme will be in place and used by each ETB in conjunction with ATU. Given the programmes are administered by three ETBs all interviewers will receive training in relation to the interview process and implementation of the marking scheme to ensure consistency. Students will be ranked at each location for admission based on interview scores. In instances where it is impossible to distinguish between candidates and the programme is oversubscribed a process agreed between the ETBs and ATU will apply. Following the offering of places after the interview process if places remain to be filled late applicants can be considered using the same process.The Project Co-ordinators will assist in the process to ensure consistency of approach. This may involve QA Teams from ATU and the three ETBs as appropriate. The process will be reviewed annually.

Selection Criteria:

Subject to meeting the minimum entry requirements the following criteria will be used to assess and rank applicants:

- Prior success and achievement in formal and informal education
- Work and/or life experience
- Evidence of relevant extracurricular activities
- Motivation for/Interest and knowledge of the programme and disciplinary career options
- Mathematical Competence will be a key consideration
- Applicant is from one of the target groups outlined in the National Access Plan

English Language Requirements

The recommended minimum requirement for English language for entry to the Tertiary Degree Programme. This level listed represent the minimum standard needed in general and in some fields, higher levels may be required.

Applicants for whom English is not their first language will be required to provide evidence of English Language Proficiency through one of the following mechanisms:

1. A valid certificate in English language from one of the institutions listed below.

2. English language proficiency assessment conducted by relevant ETB during the enrolment process.

3. Recognition of prior learning, which may be applied to students who have, in the previous 12 months, successfully achieved a full award in a cognate discipline at an appropriate level on the National Framework of Qualifications, e.g., at NFQ Level 5 if applying for a course at NFQ Level 6.

Minimum B2 in all skills on entry.

International Examinations: Cambridge First Certificate in English (FCE), Minimum Grade - Grade B or higher

International Examinations: Cambridge Advanced (CAE), Minimum Grade - Borderline Fail Min 170 points

International Examinations: Cambridge Proficiency (CPE), Minimum Grade- Unsuccessful With min. 170 points

International Examinations IELTS, Minimum Grade 6

Note: IELTS certificates are only valid two years from the date of assessment. It is recommended that the same validity duration is applied to all other examinations.

Transfer Routes

NA

Progression Pathways

Students can progress to a Masters' degree in a relevant discipline.

Teaching & Learning Strategy

Considering the profile of the learners, this programme will be mainly delivered face to face with a limited amount of online activities.

Four types of modules have been identified.

Type 1- These modules will be delivered face to face delivery with practical applications in laboratory settings or tutorial classes for modules such as Mathematics.

Type 2- These modules will be delivered through online synchronous and on-site workshop days. In this case the online class will serve as lectures, tutorials and some computer based laboratories, whereas the on-site classes will be used for technologies that can only be accessed on-site or to assess and support students' progress with computer based applications.

Type 3- These modules will be delivered fully online with a mix of synchronous and asynchronous activities.

Type 4- In their work-placement and their final year project, self-directed learning will be the main source of learning under the guidance of a supervisor.

Teaching and learning strategies in the classroom

The following strategies are being used to deliver the modules.

- Direct-instruction strategy: e.g. online synchronous lectures;
- Activity-based strategy: e.g. practice various techniques or prove concepts during practical activities; repeat an activity, review and feedback; individual projects; case studies
- Cooperative strategy: e.g. facilitated group work to critically explore, formulate and communicate ideas, interpretations and conclusions; group projects
- ICT-based strategy: use of a virtual learning environment (Moodle) for interactive activities, information storage and assessment (quizzes); use software in class; use of various tools for feedback and formative assessment (e.g. Socrative, Padlet); use of Microsoft Teams for synchronous lectures delivery and for group work in breakout rooms
- Independent learning strategy: e.g. directed study, flipped classroom Critical thinking-skills strategy: e.g. problem-solving; creative thinking.

Assessment Strategy

In designing the programme, the programme design team considered the balance between formative and summative assessments. They have also ensured that a range of assessment methodologies are utilised as appropriate to assess the module and programme learning outcomes, including the development of transferable skills.

On the self-learning side, it is important for students and lecturers to measure progress, therefore a number of modules use regular low stake assessments that are usually synchronised or embedded with the learning material. They act not only as summative assessments but also as formative ones since they help students extract and reinforce the key points of the lessons. As they are regular, they contribute to better distribution of the workload across the semester.

Similarly, low stake assessments are used in the laboratory context to encourage attendance and engagement. These assessments demonstrate that students have acquired the skill targeted by the lesson. They are embedded in the laboratory work so as not to increase the workload on students.

At the beginning of the semester, the programme board will meet to discuss the assessment schedule to avoid over-assessment and spread the workload as evenly as possible across the semester. Each lecturer will discuss their assessment schedule with students and publish it on their Moodle page.

Lecturers on the programme will collaborate to design their assessments. The final exams will be the same in all centres and one external examiner will

be appointed for the entire programme across the different delivery centres.

Student Feedback Strategy

There is at least one student of the programme on the Programme Board which meets at least three times per year. This allows students to raise and discuss any issues that may arise during the programme.

As the intake on the programme will be relatively low with on-site classes every week, informal regular feedback will be expected.

There are also the standard student feedback mechanisms in accordance with ATU Policies and Procedures.

Programme Learning Outcomes

Strand	Programme Learning Outcomes *On successful completion of this programme the learner will/should be able to:*	Modules Mapped to Outcomes
Knowledge Breadth	1. Demonstrate an understanding of the theory, concepts and methods pertaining to the field of sustainable engineering technologies, including their role in achieving the sustainable development goals.	MATH06052 Engineering Mathematics 1 ENGI06069 Engineering Science ENVI06021 Sustainability in Industry CIVE06109 Computer Aided Design -2D MECH06034 Introduction to Manufacturing Engineering MECH06033 Computer Aided Design -3D ENER06008 Electrical Science CIVE06110 Construction Technology and Building Services ELEC06005 Manufacturing Automation (Apprenticeship) MATH06023 Engineering Mathematics 2 (Apprenticeship) ENER06005 Building Information Modelling I - Fundamentals ENER06004 Renewable Energy Technologies ENGI06068 Thermodynamics MECH06031 Building Information Modelling II - Building Services ENGI06070 Regulatory Affairs MECH06035 Sustainable Design 1 COMP06081 Virtualization for Green IT COMP06080 Mathematics for Computing 1 COMP06079 Cloud and Green Computing COMP06084 Introduction to Data Science COMP06082 Computer Architecture and Operating Systems 1 COMP06083 Database Systems COMP06086 Python Scripting COMP06085 Computer Architecture and Operating Systems 2 ELEC07094 Robotics and Control ENGI07056 Manufacturing Process Planning MANU07033 Six Sigma Quality ENVI07025 Sustainable Design 2 ENER07037 Building Energy Performance COMP07134 Data Ethics and Governance COMP07132 Green/Cloud Services Technology Management COMP07133 Security and the Cloud BUST08048 Decision Theory and Data Visualisation INFO08042 Cloud Infrastructure and Enterprise Services ELEC08061 System Integration ELEC08065 Digital Twin Technology ENGI08020 Plant Engineering ENER08002 Energy Management ENGI08046 Supply Chain Engineering ENVI08009 Sustainability and Governance MECH08016 Major Project COMP08099 Cloud Planning & Design COMP08101 Management Operations in Green/Cloud Environments COMP08100 Green Data Centre Design COMP08103 Predictive Modelling COMP08104 Research in Computing with Emerging Technologies COMP08105 Data Analytics MGMT08085 Lean and Operational Excellence CIVE06112 Water and Wastewater Science COMP07136 Power and Energy Engineering ENVI08010 Distributed Generation, System Design and Integration ENVI08011 Energy and Utilities Management COMP06087 ICT and professional skills ELEC08067 Advanced Manufacturing Systems ENGI07063 Project Management (Apprenticeship)

Knowledge Kind	2. Use their detailed knowledge of sustainable engineering technologies to critically analyse where and how these technologies can be used to support their organisation in addressing the sustainable development goals. 3. Use their detailed knowledge of environmental standards and sustainable engineering technologies to support their company is securing certifications.	ENGI06069 Engineering Science ENVI06021 Sustainability in Industry MECH06034 Introduction to Manufacturing Engineering CIVE06109 Computer Aided Design -2D MECH06033 Computer Aided Design -3D ENER06008 Electrical Science CIVE06110 Construction Technology and Building Services ELEC06005 Manufacturing Automation (Apprenticeship) ENER06005 Building Information Modelling I - Fundamentals ENER06004 Renewable Energy Technologies ENGI06068 Thermodynamics MECH06031 Building Information Modelling II - Building Services ENGI06070 Regulatory Affairs MECH06035 Sustainable Design 1 COMP06081 Virtualization for Green IT COMP06080 Mathematics for Computing 1 COMP06079 Cloud and Green Computing COMP06084 Introduction to Data Science COMP06082 Computer Architecture and Operating Systems 1 COMP06083 Database Systems COMP06085 Computer Architecture and Operating Systems 2 ELEC07094 Robotics and Control ENGI07056 Manufacturing Process Planning ENVI07025 Sustainable Design 2 ENER07037 Building Energy Performance COMP07134 Data Ethics and Governance COMP07132 Green/Cloud Services Technology Management COMP07133 Security and the Cloud BUST08048 Decision Theory and Data Visualisation INFO08042 Cloud Infrastructure and Enterprise Services ELEC08061 System Integration ELEC08065 Digital Twin Technology ENGI08020 Plant Engineering ENER08002 Energy Management MECH08016 Major Project COMP08099 Cloud Planning & Design COMP08101 Management Operations in Green/Cloud Environments COMP08100 Green Data Centre Design COMP08103 Predictive Modelling COMP08104 Research in Computing with Emerging Technologies COMP08105 Data Analytics CIVE06112 Water and Wastewater Science COMP07136 Power and Energy Engineering ENVI08011 Energy and Utilities Management ENVI08010 Distributed Generation, System Design and Integration COMP06087 ICT and professional skills ELEC08067 Advanced Manufacturing Systems

Know How & Skill Range	4. Demonstrate mastery in the use of tools that can support the design and implementation of sustainable systems. 5. Demonstrate mastery in the use of tools that can support the monitoring and reporting of key performance indicators in the field of sustainability.	CIVE06109 Computer Aided Design -2D MECH06033 Computer Aided Design -3D ELEC06005 Manufacturing Automation (Apprenticeship) ENER06005 Building Information Modelling I - Fundamentals ENER06004 Renewable Energy Technologies MECH06031 Building Information Modelling II - Building Services MECH06035 Sustainable Design 1 COMP06081 Virtualization for Green IT COMP06079 Cloud and Green Computing COMP06084 Introduction to Data Science COMP06082 Computer Architecture and Operating Systems 1 COMP06083 Database Systems COMP06086 Python Scripting COMP06085 Computer Architecture and Operating Systems 2 ELEC07094 Robotics and Control ENGI07056 Manufacturing Process Planning MANU07033 Six Sigma Quality ENVI07025 Sustainable Design 2 ENER07037 Building Energy Performance BUST08048 Decision Theory and Data Visualisation ELEC08061 System Integration ELEC08065 Digital Twin Technology ENGI08020 Plant Engineering MECH08016 Major Project COMP08099 Cloud Planning & Design COMP08100 Green Data Centre Design COMP08103 Predictive Modelling COMP08104 Research in Computing with Emerging Technologies COMP08105 Data Analytics MGMT08085 Lean and Operational Excellence CIVE06112 Water and Wastewater Science COMP07136 Power and Energy Engineering ENVI08010 Distributed Generation, System Design and Integration COMP06087 ICT and professional skills ELEC08067 Advanced Manufacturing Systems ENGI07063 Project Management (Apprenticeship)

Know How & Skill Selectivity	6. Exercise appropriate judgement to select and support the implementation of engineering technologies in their company. 7. Exercise appropriate judgement to specify, select and use simulation and data processing tools to design and/or optimise systems in their organisation.	MATH06052 Engineering Mathematics 1 ENGI06069 Engineering Science ENVI06021 Sustainability in Industry CIVE06109 Computer Aided Design -2D MECH06033 Computer Aided Design -3D ENER06008 Electrical Science CIVE06110 Construction Technology and Building Services ELEC06005 Manufacturing Automation (Apprenticeship) MATH06023 Engineering Mathematics 2 (Apprenticeship) ENER06005 Building Information Modelling I - Fundamentals ENER06004 Renewable Energy Technologies ENGI06068 Thermodynamics MECH06031 Building Information Modelling II - Building Services ENGI06070 Regulatory Affairs MECH06035 Sustainable Design 1 COMP06081 Virtualization for Green IT COMP06080 Mathematics for Computing 1 COMP06079 Cloud and Green Computing COMP06084 Introduction to Data Science COMP06083 Database Systems ELEC07094 Robotics and Control ENGI07056 Manufacturing Process Planning MANU07033 Six Sigma Quality ENVI07025 Sustainable Design 2 ENER07037 Building Energy Performance COMP07134 Data Ethics and Governance COMP07132 Green/Cloud Services Technology Management COMP07133 Security and the Cloud BUST08048 Decision Theory and Data Visualisation INFO08042 Cloud Infrastructure and Enterprise Services ELEC08061 System Integration ELEC08065 Digital Twin Technology ENGI08020 Plant Engineering ENER08002 Energy Management ENGI08046 Supply Chain Engineering ENVI08009 Sustainability and Governance MECH08016 Major Project COMP08099 Cloud Planning & Design COMP08101 Management Operations in Green/Cloud Environments COMP08100 Green Data Centre Design COMP08103 Predictive Modelling COMP08102 Project Preparation COMP08104 Research in Computing with Emerging Technologies COMP08105 Data Analytics MGMT08085 Lean and Operational Excellence CIVE06112 Water and Wastewater Science COMP07136 Power and Energy Engineering ENVI08011 Energy and Utilities Management ENVI08010 Distributed Generation, System Design and Integration COMP06087 ICT and professional skills WORK07026 Engineering Work Experience ELEC08067 Advanced Manufacturing Systems ENGI07063 Project Management (Apprenticeship)

Competence Context	8. Use advanced skills in sustainable design and continuous improvement to optimise systems and drive change in their comany. 9. Used advanced skills to conduct research on advanced topics in engineering technologies and improve the contribution of their organisation to the sustainable development goals.	MECH06033 Computer Aided Design -3D CIVE06109 Computer Aided Design -2D MECH06031 Building Information Modelling II - Building Services MECH06035 Sustainable Design 1 COMP06084 Introduction to Data Science ENVI07025 Sustainable Design 2 MANU07033 Six Sigma Quality ENER07037 Building Energy Performance BUST08048 Decision Theory and Data Visualisation ELEC08065 Digital Twin Technology ELEC08061 System Integration MECH08016 Major Project COMP08100 Green Data Centre Design COMP08103 Predictive Modelling COMP08104 Research in Computing with Emerging Technologies COMP08105 Data Analytics COMP08102 Project Preparation MGMT08085 Lean and Operational Excellence COMP06087 ICT and professional skills ELEC08067 Advanced Manufacturing Systems
Competence Role	10. Act effectively under guidance in a peer relationship with qualified practitioners to conduct implementation or continuous improvement projects in an industry setting, and communicate their findings to multidisciplinary teams. 11. Lead multi-disciplinary groups in the design of systems where sustainability might conflict other interests such as cost or/and efficiency.	ENVI06021 Sustainability in Industry MECH06031 Building Information Modelling II - Building Services MECH06035 Sustainable Design 1 ENVI07025 Sustainable Design 2 BUST08048 Decision Theory and Data Visualisation ELEC08065 Digital Twin Technology ENVI08009 Sustainability and Governance MECH08016 Major Project COMP08101 Management Operations in Green/Cloud Environments COMP08105 Data Analytics WORK07026 Engineering Work Experience ELEC08067 Advanced Manufacturing Systems ENGI07063 Project Management (Apprenticeship)
Competence Learning to Learn	12. Manage learning tasks to investigate how current and emerging technologies in simulation, data processing and automation can support the planning, integration and optimisation of systems. 13. Identify gaps in personal knowledge and skills, and identify appropriate means to gain these attributes.	MECH06035 Sustainable Design 1 ENVI07025 Sustainable Design 2 COMP08102 Project Preparation COMP08104 Research in Computing with Emerging Technologies MECH08016 Major Project WORK07026 Engineering Work Experience
Competence Insight	14. Use simulation, data analytics and decision-making theory to not only identify key parameters and issues of a system, but also risk assess potential solutions. 15. Appreciate limitations of own knowledge, skills and competences, and take responsibility in the development of a society that meets the sustainable development goals.	MGMT08085 Lean and Operational Excellence MATH06052 Engineering Mathematics 1 ENER06005 Building Information Modelling I - Fundamentals MECH06031 Building Information Modelling II - Building Services MECH06035 Sustainable Design 1 COMP06080 Mathematics for Computing 1 MATH06023 Engineering Mathematics 2 (Apprenticeship) ELEC06005 Manufacturing Automation (Apprenticeship) COMP06084 Introduction to Data Science COMP06083 Database Systems ELEC07094 Robotics and Control ENVI07025 Sustainable Design 2 ENER07037 Building Energy Performance COMP07134 Data Ethics and Governance BUST08048 Decision Theory and Data Visualisation ELEC08065 Digital Twin Technology MECH08016 Major Project COMP08102 Project Preparation COMP08103 Predictive Modelling COMP08104 Research in Computing with Emerging Technologies COMP08105 Data Analytics WORK07026 Engineering Work Experience ENGI07063 Project Management (Apprenticeship)

Approved Programme Schedule - GA_ESETG_H08 Bachelor of Science (Honours) in Sustainable Engineering Technologies

Stage 1

Delivery	Code	Module Title	Level	Credit	M/E	FT	CA	PJ	PC	FE	Total
YEAR	MATH06052	Engineering Mathematics 1	06	10	M	4.00	50	0	0	50	100
YEAR	ENGI06069	Engineering Science	06	10	M	4.00	20	0	20	60	100
YEAR	ENVI06021	Sustainability in Industry	06	10	M	3.00	30	20	0	50	100
SEM 1	CIVE06109	Computer Aided Design -2D	06	05	M	4.00	70	30	0	0	100
SEM 1	COMP06087	ICT and professional skills	06	05	M	3.00	40	60	0	0	100
SEM 1	MECH06034	Introduction to Manufacturing Engineering	06	05	M	4.00	10	40	0	50	100
SEM 2	MECH06033	Computer Aided Design -3D	06	05	M	4.00	100	0	0	0	100
SEM 2	ENER06008	Electrical Science	06	05	M	4.00	30	0	20	50	100
SEM 2	CIVE06110	Construction Technology and Building Services	06	05	M	4.00	27	23	0	50	100
		Total Credits Available		60							

Semesters Per Stage	Elective Rules Per Stage	Credits Required Per Stage	Percentage Allocation towards Award
2	0	60	0

Stage Exit Award
Certificate in Sustainable Engineering

Key
M/E - Mandatory/Elective, FT - Full Time, CA - Coursework Assessment, PJ - Project, PC - Practical, FE - Final Exam,

Approved Programme Schedule

Stage 2

Delivery	Code	Module Title	Level	Credit	M/E	FT	CA	PJ	PC	FE	Total
YEAR	ENER06004	Renewable Energy Technologies	06	10	E1	5.00	100	0	0	0	100
YEAR	COMP06079	Cloud and Green Computing	06	10	E2	4.00	100	0	0	0	100
SEM 3	MGMT08085	Lean and Operational Excellence	08	05	M	2.50	100	0	0	0	100
SEM 3	ELEC06005	Manufacturing Automation (Apprenticeship)	06	10	E1	6.00	30	0	30	40	100
SEM 3	MATH06023	Engineering Mathematics 2 (Apprenticeship)	06	05	E1	4.00	40	0	0	60	100
SEM 3	ENER06005	Building Information Modelling I - Fundamentals	06	05	E1	3.00	100	0	0	0	100
SEM 3	COMP06080	Mathematics for Computing 1	06	05	E2	4.00	30	0	0	70	100
SEM 3	COMP06081	Virtualization for Green IT	06	05	E2	4.00	50	0	0	50	100
SEM 3	COMP06082	Computer Architecture and Operating Systems 1	06	05	E2	4.00	0	0	50	50	100
SEM 3	COMP06084	Introduction to Data Science	06	05	E2	4.00	100	0	0	0	100
SEM 4	MECH06035	Sustainable Design 1	06	05	M	3.00	60	40	0	0	100
SEM 4	ENGI06070	Regulatory Affairs	06	05	M	3.00	30	0	20	50	100
SEM 4	CIVE06112	Water and Wastewater Science	06	05	E1	2.31	70	30	0	0	100
SEM 4	ENGI06068	Thermodynamics	06	05	E1	5.00	40	0	0	60	100
SEM 4	MECH06031	Building Information Modelling II - Building Services	06	05	E1	4.00	0	100	0	0	100
SEM 4	COMP06083	Database Systems	06	05	E2	4.00	50	0	50	0	100
SEM 4	COMP06086	Python Scripting	06	05	E2	4.00	0	60	0	40	100
SEM 4	COMP06085	Computer Architecture and Operating Systems 2	06	05	E2	4.00	0	0	50	50	100
		Total Credits Available		105							

Semesters Per Stage	Elective Rules Per Stage	Credits Required Per Stage	Percentage Allocation towards Award
2	2	60	0

Elective Rule	Electives Required	Credits Required
ELECTIVE_2	0	45 - Select 45 Credit(s).
ELECTIVE_2	0	0

Special Regulation
For the Computing stream, students register on all the COMP modules (E2) as well as the mandatory modules. For the Manufacturing Industry stream, students register for the all modules other than COMP modules (E1).

Stage Exit Award
Higher Certificate in Science in Sustainable Engineering Technologies for the Manufacturing Industry or Higher Certificate in Science in Sustainable Engineering Technologies for Computing

Key
M/E - Mandatory/Elective, FT - Full Time, CA - Coursework Assessment, PJ - Project, PC - Practical, FE - Final Exam,

Approved Programme Schedule

Stage 3

Delivery	Code	Module Title	Level	Credit	M/E	FT	CA	PJ	PC	FE	Total
YEAR	WORK07026	Engineering Work Experience	07	25	M	0.33	15	0	85	0	100
YEAR	COMP07136	Power and Energy Engineering	07	10	E3	2.38	0	0	50	50	100
SEM 5	ELEC07094	Robotics and Control	07	10	E3	5.00	60	0	0	40	100
SEM 5	ENGI07063	Project Management (Apprenticeship)	07	05	E3	3.05	30	20	0	50	100
SEM 5	ENGI07056	Manufacturing Process Planning	07	05	E3	3.05	40	20	0	40	100
SEM 5	MANU07033	Six Sigma Quality	07	05	E3	3.00	80	20	0	0	100
SEM 5	ENVI07025	Sustainable Design 2	07	05	E3	3.00	40	60	0	0	100
SEM 5	COMP07134	Data Ethics and Governance	07	05	E3	3.00	50	0	0	50	100
SEM 5	COMP07132	Green/Cloud Services Technology Management	07	10	E3	6.00	50	0	0	50	100
SEM 5	COMP07133	Security and the Cloud	07	10	E3	6.00	40	0	0	60	100
SEM 6	ENER07037	Building Energy Performance	07	05	E3	3.00	40	60	0	0	100
		Total Credits Available		95							

Semesters Per Stage	Elective Rules Per Stage	Credits Required Per Stage	Percentage Allocation towards Award
2	1	60	0

Elective Rule	Electives Required	Credits Required
ELECTIVE_2	0	40 - Select 40 Credit(s).

Special Regulation
For the Computing stream, students register for all the COMP (E3) modules as well as the work Placement mandatory module. For the Manufacturing Industry stream, students register for all modules other than COMP modules (E4).

Stage Exit Award
BSc in Sustainable Engineering Technologies for the Manufacturing Industry or BSc in Sustainable Engineering Technologies for Computing

Key
M/E - Mandatory/Elective, FT - Full Time, CA - Coursework Assessment, PJ - Project, PC - Practical, FE - Final Exam,

Approved Programme Schedule

Stage 4

Delivery	Code	Module Title	Level	Credit	M/E	FT	CA	PJ	PC	FE	Total
YEAR	COMP08104	Research in Computing with Emerging Technologies	08	10	E5	3.00	100	0	0	0	100
YEAR	MECH08016	Major Project	08	10	M	0.83	100	0	0	0	100
SEM 7	ENVI08009	Sustainability and Governance	08	05	M	4.00	100	0	0	0	100
SEM 7	COMP08102	Project Preparation	08	05	M	3.00	100	0	0	0	100
SEM 7	BUST08048	Decision Theory and Data Visualisation	08	05	E5	4.00	100	0	0	0	100
SEM 7	INFO08042	Cloud Infrastructure and Enterprise Services	08	05	E5	4.00	30	70	0	0	100
SEM 7	ENER08002	Energy Management	08	05	E5	4.00	20	50	0	30	100
SEM 7	ENVI08011	Energy and Utilities Management	08	05	E5	4.00	30	0	0	70	100
SEM 7	COMP08100	Green Data Centre Design	08	05	E5	3.00	40	0	0	60	100
SEM 7	COMP08099	Cloud Planning & Design	08	05	E5	3.00	40	0	0	60	100
SEM 8	ELEC08061	System Integration	08	05	E5	3.00	20	30	50	0	100
SEM 8	ELEC08065	Digital Twin Technology	08	05	E5	3.00	30	50	20	0	100
SEM 8	ENGI08046	Supply Chain Engineering	08	05	E5	4.00	30	0	0	70	100
SEM 8	ELEC08067	Advanced Manufacturing Systems	08	05	M	3.00	20	30	50	0	100
SEM 8	ENGI08020	Plant Engineering	08	05	E5	4.00	20	0	0	80	100
SEM 8	ENVI08010	Distributed Generation, System Design and Integration	08	10	E5	5.00	50	0	0	50	100
SEM 8	COMP08103	Predictive Modelling	08	05	E5	3.00	100	0	0	0	100
SEM 8	COMP08105	Data Analytics	08	05	E5	4.00	65	0	35	0	100
YEAR	COMP08101	Management Operations in Green/Cloud Environments	08	10	E5	3.00	50	0	0	50	100
		Total Credits Available		115							

Semesters Per Stage	Elective Rules Per Stage	Credits Required Per Stage	Percentage Allocation towards Award
2	4	60	100

Elective Rule	Electives Required	Credits Required
ELECTIVE_3	0	45 - Select 45 Credit(s).
ELECTIVE_6	0	0

ELECTIVE_7	0	0
ELECTIVE_8	0	0

Special Regulation
For the Computing stream, students register for all the COMP (E5) modules as well as the Major Project and the Mandatory module. For the Manufacturing stream, students register for the Major project and the Mandatory module, the E6 modules (BUST0848, INFO08042, ENGI08046, ELEC08061, ELEC08065). In Sligo, they will also register for the E8 modules ENVI08010, ENVI08011. In Galway, they will also register for the E7 modules (ENGI08020, ELEC08067, ENER08002).

Stage Exit Award
BSc (Hons) in Sustainable Engineering Technologies for the Manufacturing Industry or BSc (Hons) in Sustainable Engineering Technologies for Computing

Key
M/E - Mandatory/Elective, FT - Full Time, CA - Coursework Assessment, PJ - Project, PC - Practical, FE - Final Exam,

Programme Delivery Schedule

Stage 1 - Delivery Mode Full Time

Delivery	Code	Module Title	Level	Credit	M/E	Lecture	Tutorial	Practical	Total
YEAR	MATH06052	Engineering Mathematics 1	06	10	M	3	1		4.00
YEAR	ENGI06069	Engineering Science	06	10	M	2		2	4.00
YEAR	ENVI06021	Sustainability in Industry	06	10	M		1	2	3.00
SEM 1	CIVE06109	Computer Aided Design -2D	06	05	M			4	4.00
SEM 1	COMP06087	ICT and professional skills	06	05	M			3	3.00
SEM 1	MECH06034	Introduction to Manufacturing Engineering	06	05	M	1		3	4.00
SEM 2	MECH06033	Computer Aided Design -3D	06	05	M			4	4.00
SEM 2	ENER06008	Electrical Science	06	05	M	1		3	4.00
SEM 2	CIVE06110	Construction Technology and Building Services	06	05	M	4			4.00
					Total	11.00	2.00	21.00	

Stage Average Weekly Contact Hours	Semester 1 Average Weekly Contact Hours	Semester 2 Average Weekly Contact Hours
23	22	23

Programme Delivery Schedule

Stage 2 - Delivery Mode Full Time

Delivery	Code	Module Title	Level	Credit	M/E	Lecture	Tutorial	Seminar	Practical	Online Learning	Total
YEAR	ENER06004	Renewable Energy Technologies	06	10	E1	2	1		2		5.00
YEAR	COMP06079	Cloud and Green Computing	06	10	E2	2			2		4.00
SEM 3	MGMT08085	Lean and Operational Excellence	08	05	M					2.5	2.50
SEM 3	ELEC06005	Manufacturing Automation (Apprenticeship)	06	10	E1	2			4		6.00
SEM 3	MATH06023	Engineering Mathematics 2 (Apprenticeship)	06	05	E1	2	2				4.00
SEM 3	ENER06005	Building Information Modelling I - Fundamentals	06	05	E1				3		3.00
SEM 3	COMP06080	Mathematics for Computing 1	06	05	E2	1	1		2		4.00
SEM 3	COMP06081	Virtualization for Green IT	06	05	E2	1	1		2		4.00
SEM 3	COMP06082	Computer Architecture and Operating Systems 1	06	05	E2	1	1		2		4.00
SEM 3	COMP06084	Introduction to Data Science	06	05	E2	1	1		2		4.00
SEM 4	MECH06035	Sustainable Design 1	06	05	M				3		3.00
SEM 4	ENGI06070	Regulatory Affairs	06	05	M					3	3.00
SEM 4	CIVE06112	Water and Wastewater Science	06	05	E1			0.31		2	2.31
SEM 4	ENGI06068	Thermodynamics	06	05	E1	3	2				5.00
SEM 4	MECH06031	Building Information Modelling II - Building Services	06	05	E1	1			3		4.00
SEM 4	COMP06083	Database Systems	06	05	E2	2			2		4.00
SEM 4	COMP06086	Python Scripting	06	05	E2	1			3		4.00
SEM 4	COMP06085	Computer Architecture and Operating Systems 2	06	05	E2	1	1		2		4.00
					Total	20.00	10.00	0.31	32.00	7.50	

Stage Average Weekly Contact Hours	Semester 1 Average Weekly Contact Hours	Semester 2 Average Weekly Contact Hours
0	0	0

Programme Delivery Schedule

Stage 3 - Delivery Mode Full Time

Delivery	Code	Module Title	Level	Credit	M/E	Lecture	Practical	Online Learning	Supervision	Total
YEAR	WORK07026	Engineering Work Experience	07	25	M				0.33	0.33
YEAR	COMP07136	Power and Energy Engineering	07	10	E3		1.38	1		2.38
SEM 5	ELEC07094	Robotics and Control	07	10	E3	1	4			5.00
SEM 5	ENGI07063	Project Management (Apprenticeship)	07	05	E3	1	2		0.05	3.05
SEM 5	ENGI07056	Manufacturing Process Planning	07	05	E3	2	1		0.05	3.05
SEM 5	MANU07033	Six Sigma Quality	07	05	E3	1	2			3.00
SEM 5	ENVI07025	Sustainable Design 2	07	05	E3		3			3.00
SEM 5	COMP07134	Data Ethics and Governance	07	05	E3	1	2			3.00
SEM 5	COMP07132	Green/Cloud Services Technology Management	07	10	E3	2	4			6.00
SEM 5	COMP07133	Security and the Cloud	07	10	E3	2	4			6.00
SEM 6	ENER07037	Building Energy Performance	07	05	E3			3		3.00
					Total	10.00	23.38	4.00	0.43	

Stage Average Weekly Contact Hours	Semester 1 Average Weekly Contact Hours	Semester 2 Average Weekly Contact Hours
0	0	0

Programme Delivery Schedule

Stage 4 - Delivery Mode Full Time

Delivery	Code	Module Title	Level	Credit	M/E	Lecture	Tutorial	Practical	Online Learning	Supervision	Total
YEAR	COMP08104	Research in Computing with Emerging Technologies	08	10	E5	1		2			3.00
YEAR	MECH08016	Major Project	08	10	M	0.5				0.33	0.83
SEM 7	ENVI08009	Sustainability and Governance	08	05	M				4		4.00
SEM 7	COMP08102	Project Preparation	08	05	M				3		3.00
SEM 7	BUST08048	Decision Theory and Data Visualisation	08	05	E5				4		4.00
SEM 7	INFO08042	Cloud Infrastructure and Enterprise Services	08	05	E5				4		4.00
SEM 7	ENER08002	Energy Management	08	05	E5	1		3			4.00
SEM 7	ENVI08011	Energy and Utilities Management	08	05	E5	2	2				4.00
SEM 7	COMP08100	Green Data Centre Design	08	05	E5	1		2			3.00
SEM 7	COMP08099	Cloud Planning & Design	08	05	E5	1		2			3.00
SEM 8	ELEC08061	System Integration	08	05	E5			2	1		3.00
SEM 8	ELEC08065	Digital Twin Technology	08	05	E5			2	1		3.00
SEM 8	ENGI08046	Supply Chain Engineering	08	05	E5	2		2			4.00
SEM 8	ELEC08067	Advanced Manufacturing Systems	08	05	M			1	2		3.00
SEM 8	ENGI08020	Plant Engineering	08	05	E5	2		2			4.00
SEM 8	ENVI08010	Distributed Generation, System Design and Integration	08	10	E5	2		3			5.00
SEM 8	COMP08103	Predictive Modelling	08	05	E5	1		2			3.00
SEM 8	COMP08105	Data Analytics	08	05	E5	1	1	2			4.00
YEAR	COMP08101	Management Operations in Green/Cloud Environments	08	10	E5	1		2			3.00
					Total	15.50	3.00	27.00	19.00	0.33	

Stage Average Weekly Contact Hours	Semester 1 Average Weekly Contact Hours	Semester 2 Average Weekly Contact Hours
0	0	0

Programme Assessment Matrix

Stage 1 Year Long

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
MATH06052	Engineering Mathematics 1	M	FE	Final exam	1,2,3,4,5	50	End of Term
ENGI06069	Engineering Science	M	FE	Final Exam Written examination	1,2,3,4,5,6,7	60	End of Term
ENVI06021	Sustainability In Industry	M	FE	Final exam	1,2,3,4,5,6,7	50	End of Year
MATH06052	Engineering Mathematics 1	M	CA	Journal Work, Online Quizzes, Written Assessments	1,2,3,4,5	50	OnGoing
ENGI06069	Engineering Science	M	PC	Practical Evaluation Laboratory	1,3,4,5,6,7	20	OnGoing
ENGI06069	Engineering Science	M	CA	Class Assessment Written examination	1,2,3,4,5,6,7	20	OnGoing
ENVI06021	Sustainability In Industry	M	CA	Portfolio	1,2,3,4,5,6,7	20	OnGoing
ENVI06021	Sustainability In Industry	M	PJ	Disassembly of products	6,8	20	OnGoing
ENVI06021	Sustainability In Industry	M	CA	Online quizzes	1,2,3,4,5,6,7	10	OnGoing

Programme Assessment Matrix

Stage 1 Semester 1

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
COMP06087	Ict And Professional Skills	M	CA	Engineering ethics	1,3	10	Week 7
COMP06087	Ict And Professional Skills	M	PJ	Group assignment	1,2,4	20	Week 13
COMP06087	Ict And Professional Skills	M	CA	Presentation skills	1,2,4	20	Week 20
COMP06087	Ict And Professional Skills	M	PJ	Portfolio	1,2,3,4,5	40	Week 26
MECH06034	Introduction To Manufacturing Engineering	M	FE	Exam	1,3,4	50	End of Year
CIVE06109	Computer Aided Design -2d	M	PJ	Project	4,5,6,7	30	End of Semester
MECH06034	Introduction To Manufacturing Engineering	M	PJ	Environmental impact of manufacturing process	1,2,4	10	End of Semester
CIVE06109	Computer Aided Design -2d	M	CA	Class Assessment class exercises, homework, in-class examination	1,2,3	70	OnGoing
COMP06087	Ict And Professional Skills	M	CA	Module Participation	1,2,5	10	OnGoing
MECH06034	Introduction To Manufacturing Engineering	M	CA	Moodle Quizzes	1,2,3,4	10	OnGoing
MECH06034	Introduction To Manufacturing Engineering	M	PJ	Artefacts manufactured	2,3	30	OnGoing

Programme Assessment Matrix

Stage 1 Semester 2

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
CIVE06110	Construction Technology And Building Services	M	FE	Final Exam	1,2,3,4,5	50	End of Term
ENER06008	Electrical Science	M	FE	Final Exam	1,3,4	50	End of Semester
MECH06033	Computer Aided Design -3d	M	CA	CAD Exercise	1,2,3,4,5,6	100	OnGoing
ENER06008	Electrical Science	M	CA	Quizzes	1,2,3,4	20	OnGoing
ENER06008	Electrical Science	M	PC	Practicals	2,3,4	20	OnGoing
CIVE06110	Construction Technology And Building Services	M	CA	CT Assessments	1,2,3	20	OnGoing
CIVE06110	Construction Technology And Building Services	M	PJ	CT Projects	2,3	15	OnGoing
CIVE06110	Construction Technology And Building Services	M	CA	BS Assessment	4	7	OnGoing
CIVE06110	Construction Technology And Building Services	M	PJ	BS Project	5	8	Any
ENER06008	Electrical Science	M	CA	Project	4	10	TBA

Programme Assessment Matrix

Stage 2 Year Long

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
COMP06079	Cloud And Green Computing	E	CA	Continuous Assessment	1,2,3,4,5,6	100	End of Semester
ENER06004	Renewable Energy Technologies	E	CA	Practical Evaluation Laboratory work	2,3,5,6	40	OnGoing
ENER06004	Renewable Energy Technologies	E	CA	Class Assessment Class Assessment	1,2,3,4,5,6	60	OnGoing

Programme Assessment Matrix

Stage 2 Semester 1

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
ELEC06005	Manufacturing Automation (Apprenticeship)	E	CA	Class Assessment	1,2,4,7	30	Week 8
ELEC06005	Manufacturing Automation (Apprenticeship)	E	FE	Practical Assessment of PLC design and programming	5,6,7	40	End of Semester
MATH06023	Engineering Mathematics 2 (Apprenticeship)	E	FE	End of semester assessment	1,2,3,4	60	End of Semester
COMP06080	Mathematics For Computing 1	E	CA	Continuous Assesment	1,2,3,4,5	30	End of Semester
COMP06080	Mathematics For Computing 1	E	FE	Final Exam	1,2,3,4,5	70	End of Semester
COMP06081	Virtualization For Green It	E	CA	Continuous Assessment	2,4	50	End of Semester
COMP06081	Virtualization For Green It	E	FE	Final Exam	1,3,5	50	End of Semester
COMP06082	Computer Architecture And Operating Systems 1	E	FE	Examination	1,2,3,5	50	End of Semester
MGMT08085	Lean And Operational Excellence	M	CA	Moodle Online and Offline Assignments, Blogs and Quiz submissions	1,2,3,4,5	100	OnGoing
ELEC06005	Manufacturing Automation (Apprenticeship)	E	PC	Mixture of simulation, written assesment and practical evaluation	3,4,5,6	30	OnGoing
MATH06023	Engineering Mathematics 2 (Apprenticeship)	E	CA	Journal Work, Online Quizzes, Written Assessments, Practical Assignment	1,2,3,4	40	OnGoing
ENER06005	Building Information Modelling I - Fundamentals	E	CA	BIM project	1,2,3,4,5	100	OnGoing
COMP06082	Computer Architecture And Operating Systems 1	E	PC	Windows 10 Basic File-System and Infrastructure – GUI and command line	4	15	OnGoing
COMP06082	Computer Architecture And Operating Systems 1	E	PC	Windows 10 Installation and System Administration on a VM	4	15	OnGoing
COMP06082	Computer Architecture And Operating Systems 1	E	PC	Computer Hardware Practicals	1,2	20	OnGoing
COMP06084	Introduction To Data Science	E	CA	Given a business problem prepare a data set for exploration and analysis.	1,2,3	30	OnGoing
COMP06084	Introduction To Data Science	E	CA	Perform various data analysis tasks	4	40	OnGoing
COMP06084	Introduction To Data Science	E	CA	Communicate the results of the analysis to end users.	5	30	OnGoing

Programme Assessment Matrix

Stage 2 Semester 2

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
CIVE06112	Water And Wastewater Science	E	CA	Flow Diagram Oral Presentation	1,3	40	Week 18
ENGI06068	Thermodynamics	E	CA	Class Assessment	2,3,4,5	20	Week 21
ENGI06068	Thermodynamics	E	FE	Final Exam	1,2,3,4,5	60	End of Term
ENGI06070	Regulatory Affairs	M	FE	Assessment	1,2,3,4	50	End of Semester
ENGI06070	Regulatory Affairs	M	CA	Case studies	1,2,3,4	20	End of Semester
CIVE06112	Water And Wastewater Science	E	PJ	Presentation	1,3	30	End of Semester
MECH06031	Building Information Modelling Ii - Building Services	E	PJ	MEP Project	1,2,3,4	100	End of Semester
COMP06086	Python Scripting	E	PJ	The student will create a solution to a given business problem utilizing techniques demonstrated in class.	1,2,3,4	30	End of Semester
COMP06086	Python Scripting	E	PJ	The student will create a solution to a given business problem utilizing techniques demonstrated in class.	1,2,3,4	30	End of Semester
COMP06086	Python Scripting	E	FE	Final Exam	1,2,3,4	40	End of Semester
COMP06085	Computer Architecture And Operating Systems 2	E	PC	Installation of Linux onto computer system.	3	10	End of Semester
COMP06085	Computer Architecture And Operating Systems 2	E	PC	Command Line Language Class Test on Linux virtual machine.	2,3	25	End of Semester
COMP06085	Computer Architecture And Operating Systems 2	E	PC	Shell programming test on Linux virtual machine	3	15	End of Semester
COMP06085	Computer Architecture And Operating Systems 2	E	FE	Examination	1,2	50	End of Semester
MECH06035	Sustainable Design 1	M	PJ	Re-Design of manufactured product	1	40	OnGoing
MECH06035	Sustainable Design 1	M	CA	Cad Labs	2	20	OnGoing
MECH06035	Sustainable Design 1	M	CA	Class Tutorials	4	20	OnGoing
MECH06035	Sustainable Design 1	M	CA	Materials Selection Labs	3	20	OnGoing
ENGI06070	Regulatory Affairs	M	CA	Online quizzes	1,2,3,4	10	OnGoing
ENGI06070	Regulatory Affairs	M	PC	Quality tools exercises	3	20	OnGoing

CIVE06112	Water And Wastewater Science	E	CA	MCQ	2,4	30	OnGoing
ENGI06068	Thermodynamics	E	CA	Laboratory Experimentation	4,5	20	OnGoing
COMP06083	Database Systems	E	CA	Student to develop an ERD based on system description given. Identify all required keys and map the ERD to a set of relational/non-relational database tables.	1,2,3	25	OnGoing
COMP06083	Database Systems	E	CA	Given a set of unnormalised data the student will identify dependencies, assess problematic table design, and transform to generate a set of normalised relational tables.	3,4	25	OnGoing
COMP06083	Database Systems	E	PC	Student will take a set of Normalised relational tables and create a database architecture and populate with data. They will write SQL queries to return data as requested from single and multiple tables.	1,2,3,4,5	50	OnGoing

Programme Assessment Matrix

Stage 3 Year Long

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
COMP07136	Power And Energy Engineering	E	PC	Lab	1,2,3,4	50	Week 8
WORK07026	Engineering Work Experience	M	PC	Process Study Report	5,7	10	End of Term
WORK07026	Engineering Work Experience	M	PC	Technical Project Report	3,4,5,6,7,8	20	End of Term
WORK07026	Engineering Work Experience	M	PC	Placement Presentation	2,4,7	10	End of Term
WORK07026	Engineering Work Experience	M	PC	Supervisor's Review	4,5,8	10	End of Term
WORK07026	Engineering Work Experience	M	PC	Reflection on learning outcomes	3,4,5,6,7,8,9	10	End of Term
COMP07136	Power And Energy Engineering	E	FE	Exam	4,5,6,7	50	End of Semester
WORK07026	Engineering Work Experience	M	CA	CV Preparation	1,7,9	15	OnGoing
WORK07026	Engineering Work Experience	M	PC	Mock Interview	2,7,9	10	OnGoing
WORK07026	Engineering Work Experience	M	PC	Log Book	3,4,6,7,8,9	15	OnGoing

Programme Assessment Matrix

Stage 3 Semester 1

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
MANU07033	Six Sigma Quality	E	PJ	Mini Project / case study	1,2,3,4,5,6	20	Week 13
ENGI07063	Project Management (Apprenticeship)	E	FE	Exam	1,2	50	End of Term
ELEC07094	Robotics And Control	E	FE	Final Exam End of term exam	1,2,4,5,6	40	End of Semester
ENGI07056	Manufacturing Process Planning	E	FE	Exam-type assessment	2	40	End of Semester
ENVI07025	Sustainable Design 2	E	PJ	Project	2,3	60	End of Semester
COMP07134	Data Ethics And Governance	E	CA	Continuous Assessment	1,2,3,4,5,6	50	End of Semester
COMP07134	Data Ethics And Governance	E	FE	Final Exam	1,2,3,4,5,6	50	End of Semester
COMP07132	Green/Cloud Services Technology Management	E	CA	Continuous Assesment	1,2,3,4,5	50	End of Semester
COMP07132	Green/Cloud Services Technology Management	E	FE	Final Exam	1,3,5	50	End of Semester
COMP07133	Security And The Cloud	E	CA	Continuous Assessment	3,5	40	End of Semester
COMP07133	Security And The Cloud	E	FE	Final Exam	1,2,3,4,5,6	60	End of Semester
ELEC07094	Robotics And Control	E	CA	Lab assessments	1,2,3,4,5,7	60	OnGoing
ENGI07063	Project Management (Apprenticeship)	E	CA	Project	1,2,3,4,5	30	OnGoing
ENGI07063	Project Management (Apprenticeship)	E	PJ	Industry Project	2,3	20	OnGoing
ENGI07056	Manufacturing Process Planning	E	CA	In class/lab assessment	1,3,4	40	OnGoing
ENGI07056	Manufacturing Process Planning	E	PJ	Industry project	5	20	OnGoing
MANU07033	Six Sigma Quality	E	CA	DMAIC Theory and Tools	1,2,3,4,5,6	50	OnGoing
MANU07033	Six Sigma Quality	E	CA	Minitab Practicals	3,4,5	30	OnGoing
ENVI07025	Sustainable Design 2	E	CA	Continuous Assessment	1,2,3	40	OnGoing

Programme Assessment Matrix

Stage 3 Semester 2

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
ENER07037	Building Energy Performance	E	CA	U-value calculation assessment	2	10	Week 29
ENER07037	Building Energy Performance	E	PJ	BER and energy bills assessment of a dwelling	1,2,3	30	Week 35
ENER07037	Building Energy Performance	E	CA	Building Sensor Systems	4	10	Week 36
ENER07037	Building Energy Performance	E	CA	Energy analysis and Auditing	4	20	Week 41
ENER07037	Building Energy Performance	E	PJ	Energy audit and rating of a building other than dwelling	1,3	30	Week 43

Programme Assessment Matrix

Stage 4 Year Long

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
COMP08101	Management Operations In Green/Cloud Environments	E	CA	Continuous Assessment	1,2,3,4,5,6	50	End of Semester
COMP08101	Management Operations In Green/Cloud Environments	E	FE	Final Exam	1,3,5,6	50	End of Semester
COMP08104	Research In Computing With Emerging Technologies	E	CA	Reflective Journal	1,6	15	OnGoing
COMP08104	Research In Computing With Emerging Technologies	E	CA	Documentation	1,2,3,4,5	70	OnGoing
COMP08104	Research In Computing With Emerging Technologies	E	CA	Prototype & Presentation	5,6	15	OnGoing
MECH08016	Major Project	M	CA	Assessment as per assessment strategy	1,2,3,4,5,6	100	OnGoing

Programme Assessment Matrix

Stage 4 Semester 1

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
ENVI08011	Energy And Utilities Management	E	CA	Assignment	1,2,3,4,5,6	30	Week 7
BUST08048	Decision Theory And Data Visualisation	E	CA	Project	1,2,3,4,5,6	60	Week 13
INFO08042	Cloud Infrastructure And Enterprise Services	E	PJ	Cloud Services, Security and Business Continuity	1,2,3,4,5,6	70	Week 13
COMP08100	Green Data Centre Design	E	CA	Continuous Assessment	1,2,3	40	Week 13
COMP08099	Cloud Planning & Design	E	CA	Continuous Assessment	3,4	40	Week 13
ENVI08009	Sustainability And Governance	M	CA	Climate Resilience for business Capstone CA	1,2,3,4,5	50	End of Term
ENER08002	Energy Management	E	FE	Final Exam End of Term Exam	1,2,3,4	30	End of Term
COMP08099	Cloud Planning & Design	E	FE	Final Exam	1,2,3,4	60	End of Year
ENVI08009	Sustainability And Governance	M	CA	CSR Policy	4,5	20	End of Semester
COMP08102	Project Preparation	M	CA	Continuous Assessment	1,2,3,4,5,6	100	End of Semester
ENVI08011	Energy And Utilities Management	E	FE	Exam	1,2,3,4,5,6	70	End of Semester
COMP08100	Green Data Centre Design	E	FE	Final Exam	1,2,3,4	60	End of Semester
ENVI08009	Sustainability And Governance	M	CA	Climate Resilience	1,5	30	OnGoing
BUST08048	Decision Theory And Data Visualisation	E	CA	Weekly Exercises	1,2,3,4,5,6	40	OnGoing
INFO08042	Cloud Infrastructure And Enterprise Services	E	CA	Cloud Computing Fundamentals	1,4,5	30	OnGoing
ENER08002	Energy Management	E	CA	Assessment of selection, implementation and economic analysis of energy projects in a range of industrial environments.	1,2,3,4	20	TBA
ENER08002	Energy Management	E	PJ	Project entailing the implementation of an Energy Management System (ISO 50001) in a range of Industry Sectors	3,4	25	TBA
ENER08002	Energy Management	E	PJ	Project on EU and National Energy Policy, Legislation, Regulations and Standards for different Industry Sectors	2	25	TBA

Programme Assessment Matrix

Stage 4 Semester 2

Code	Module Title	M/E	Type	Description	Module Outcomes Assessed	% of Total	Indicative Week
ELEC08061	System Integration	E	PJ	Data architecture analysis	1,2,3,5	30	End of Term
ELEC08061	System Integration	E	PC	End of term practical assessment	2,3,4	20	End of Term
ELEC08065	Digital Twin Technology	E	CA	Discussion on the benefits of IIoT and digital twins	1,2,3	30	End of Term
ELEC08065	Digital Twin Technology	E	PJ	Digital Twin project	4	50	End of Term
ENGI08020	Plant Engineering	E	FE	Final Exam Exam	1,2,3,4,5	80	End of Term
ENGI08046	Supply Chain Engineering	E	FE	Exam	1,2,3,4,5	70	End of Semester
ELEC08067	Advanced Manufacturing Systems	M	PJ	Continuous improvement project	1,2,3,4,5	30	End of Semester
ENVI08010	Distributed Generation, System Design And Integration	E	FE	Exam	1,2,3,4,5,6	50	End of Semester
COMP08103	Predictive Modelling	E	CA	Continuous Assessment	1,2,3,4,5	100	End of Semester
ELEC08061	System Integration	E	CA	Online quizzes	1,2,3,5	20	OnGoing
ELEC08061	System Integration	E	PC	Programming and Troubleshooting	2,3,4	30	OnGoing
ELEC08065	Digital Twin Technology	E	PC	Practical Assignments	3,4	20	OnGoing
ENGI08046	Supply Chain Engineering	E	CA	CA	1,2,3,4,5	30	OnGoing
ELEC08067	Advanced Manufacturing Systems	M	PC	Lab assessments	2,3,4	50	OnGoing
ELEC08067	Advanced Manufacturing Systems	M	CA	Online quizzes	1,2,3,4	20	OnGoing
ENVI08010	Distributed Generation, System Design And Integration	E	CA	Practical	1,2,3,4,5,6	50	OnGoing
COMP08105	Data Analytics	E	CA	Case study: Impact and evolution data analytics and real world insight	1,3,5	40	OnGoing
COMP08105	Data Analytics	E	CA	Statistical Programming Language understanding and use	1,2,3	25	OnGoing
COMP08105	Data Analytics	E	PC	Data analytics challenge to produce data visualisation and derive insight	3,4,6	35	OnGoing
ENGI08020	Plant Engineering	E	CA	Class Assessment Continuous Assessment	1,2	20	TBA

Approved Modules

Stage	Approved Modules	New Modules
1		MATH06052 Engineering Mathematics 1 ENGI06069 Engineering Science ENVI06021 Sustainability in Industry CIVE06109 Computer Aided Design -2D COMP06087 ICT and professional skills MECH06034 Introduction to Manufacturing Engineering MECH06033 Computer Aided Design -3D ENER06008 Electrical Science CIVE06110 Construction Technology and Building Services
2	ENER06004 Renewable Energy Technologies ELEC06005 Manufacturing Automation (Apprenticeship) MATH06023 Engineering Mathematics 2 (Apprenticeship) ENER06005 Building Information Modelling I - Fundamentals ENGI06068 Thermodynamics MECH06031 Building Information Modelling II - Building Services	COMP06079 Cloud and Green Computing MGMT08085 Lean and Operational Excellence COMP06080 Mathematics for Computing 1 COMP06081 Virtualization for Green IT COMP06082 Computer Architecture and Operating Systems 1 COMP06084 Introduction to Data Science MECH06035 Sustainable Design 1 ENGI06070 Regulatory Affairs CIVE06112 Water and Wastewater Science COMP06083 Database Systems COMP06086 Python Scripting COMP06085 Computer Architecture and Operating Systems 2
3	ELEC07094 Robotics and Control ENGI07063 Project Management (Apprenticeship) ENGI07056 Manufacturing Process Planning MANU07033 Six Sigma Quality	WORK07026 Engineering Work Experience COMP07136 Power and Energy Engineering ENVI07025 Sustainable Design 2 COMP07134 Data Ethics and Governance COMP07132 Green/Cloud Services Technology Management COMP07133 Security and the Cloud ENER07037 Building Energy Performance
4	BUST08048 Decision Theory and Data Visualisation INFO08042 Cloud Infrastructure and Enterprise Services ENER08002 Energy Management ELEC08061 System Integration ELEC08065 Digital Twin Technology ENGI08046 Supply Chain Engineering ENGI08020 Plant Engineering	COMP08104 Research in Computing with Emerging Technologies MECH08016 Major Project ENVI08009 Sustainability and Governance COMP08102 Project Preparation ENVI08011 Energy and Utilities Management COMP08100 Green Data Centre Design COMP08099 Cloud Planning & Design ELEC08067 Advanced Manufacturing Systems ENVI08010 Distributed Generation, System Design and Integration COMP08103 Predictive Modelling COMP08105 Data Analytics COMP08101 Management Operations in Green/Cloud Environments

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Stage 1 Modules

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MATH06052 2023
Engineering Mathematics 1

Mandatory Delivered in Stage 1 Year Long

Full Title	Engineering Mathematics 1		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module is designed to introduce students to the fundamental mathematical concepts and techniques used in the practice of manufacturing engineering and, in the process, develop the skill of analysing problems logically and the ability to transfer their mathematical understanding to engineering applications.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Manipulate symbolic statements and expressions according to the transformational rules of mathematics.
2.	Solve a range of equations and applied problems using mathematical methods from algebra, trigonometry and basic calculus.
3.	Formulate and use mathematical representations (symbolic, numeric, graphical, visual, verbal) and identify their relations, advantages and limitations.
4.	Critique a peer's work objectively and communicate constructive feedback orally and in writing.
5.	Communicate orally and in written form the reasoning and procedure for solving a mathematical problem.

Indicative Syllabus

Basic Algebra and Numeracy

- Order of operations
- Fractions
- Indices
- Expanding, dividing and factorising algebraic expressions
- Partial fractions
- Logarithms
- Transposition of formulae
- Equations: linear, quadratic, simultaneous, logarithmic, exponential, trigonometric

Functions and Graphs

- Linear functions
- Quadratic functions
- Logarithmic functions
- Exponential equations
- Different representations of functions: situation, table, equation, graph

Trigonometry and Geometry

- Angular measure
- Trigonometric ratios
- Solution of right-angled triangles
- Solution of non-right-angled triangles
- Sine and cosine waveforms.

Vectors

- Cartesian co-ordinates.
- Scalar and vector quantities
- Graphical addition of vectors
- Unit co-ordinate vectors, component form
- Vector products

Complex Numbers

- The Argand diagram
- Arithmetic of complex numbers
- Solution of quadratic equations with complex roots
- Polar form

Differentiation

- Functions and limits
- Geometric interpretation of the derivative.
- Standard derivatives
- Higher derivatives
- Product Rule, Quotient Rule and Chain Rule
- Applications of differentiation to rates of change, curve sketching and optimisation

Integration

- Anti-differentiation, Indefinite integrals
- Integration as a process of summation, Definite integrals
- The area under a curve

Matrices

- Matrix arithmetic
- Determinants
- The inverse of a matrix
- Solution of linear equations by matrix methods

Teaching and Learning Strategy

The teaching and learning strategy will include:

- **Direct instruction** including worked examples, provision of class notes, additional exercises to assist with procedural fluency
- **Self-directed learning** using ICT based activities
- **Learning-oriented assessment** using a mathematics journal system
- **Peer learning** involving cooperation, communication and the giving and receiving of peer feedback through the journal system

Assessment Strategy

End of year exam

Written assessments

Journal System (Self-directed learning, Peer Learning, Learning-oriented assessment, Direct instruction)

Moodle quizzes (Self-directed learning, Learning-oriented assessment)

Repeat Assessment Strategies

Repeat examination (written assessment)

Additional Facilities

N/A

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Journal Work, Online Quizzes, Written Assessments	50 %	OnGoing	1,2,3,4,5

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final exam	50 %	End of Term	1,2,3,4,5

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Not Specified	3	Weekly
Tutorial	Tutorial	Flat Classroom	1	Weekly

Recommended Reading Book List

Robert, A., *Foundation Maths 7th Edition PDF Ebook*. 8th Edition. Pearson UK.
ISBN 9781292289731 ISBN-13 1292289732

Bird, J., *Bird's Basic Engineering Mathematics*. 8th Edition. Routledge.
ISBN 9781000299366 ISBN-13 1000299368

Bird, J., *Bird's Engineering Mathematics*. 9th Edition. Routledge.
ISBN 0367643782 ISBN-13 9780367643782

Robert, A., *Mathematics for Engineers*. 5th Edition. Pearson Higher Ed.
ISBN 9781292267661 ISBN-13 1292267666

Dexter, K., *Engineering Mathematics*. 8th Edition. Macmillan International Higher Education. ISBN 9781137031228 ISBN-13 1137031220
Lothar, J., *Precalculus: Mathematics for Calculus*. 7th Edition. Cengage Learning. ISBN 1305071751 ISBN-13 9781305071759
Calter, *Technical Mathematics with Calculus, Third Canadian Edition* . 3rd Edition. John Wiley & Sons. ISBN 1118962141 ISBN-13 9781118962145

Online Resources
mathtutor.ac.uk
mathcentre.ac.uk
khanacademy.org

Other Resources
Maths Learning Centre
Microsoft OneNote program (or similar) for free-form information gathering and multi-user collaboration
Game-based learning platforms e.g Kahoot
Formative online assessment tools e.g. Socrative

Programme Membership

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ENGI06069 2023
Engineering Science

Mandatory Delivered in Stage 1 Year Long

Full Title	Engineering Science		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

Engineering Science is an introductory module which integrates basic engineering and scientific principles for the understanding and analysis of engineering related problems in physics and chemistry.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Explain how material properties are linked to their atomic and molecular structure.
2.	Describe the different type of materials and explain the reason why they can or cannot be reused or recycled.
3.	Describe the different states of matter and calculate the amount of energy required to change from one state to another.
4.	Explain relationships between pressure, volume and temperature and solve problems using gas laws.
5.	Calculate both the amount of energy required to change the temperature of a liquid by a given amount and the final temperature of a mixture.
6.	Explain how heat is transferred and solve problems of thermal expansion.
7.	Explain how force, work, energy and power are related and calculate the energy required to run basic mechanical systems.

Indicative Syllabus

CHEMISTRY AND MATERIALS

- Structure of the atom
- Elements and the periodic table.
- Bonding
- Molecules
- Materials
- Reuse and recycle

STATES OF MATTER

- Structure and properties of solids, liquids and gases
- Force and pressure
- Density
- Gas laws

HEAT:

- Temperature and temperature scales
- Heat transfer modes
- Heat transfer in mixtures
- Fuels and calorific values
- Specific heat capacity
- Latent heat
- Expansion of solids

STATICS

- Force as a vector - magnitude and direction of a force.
- Moment of a force.
- Torque

KINEMATICS:

- Displacement
- Velocity
- Acceleration.

- Energy
- Power

Teaching and Learning Strategy

The module is divided into lectures and pratical. In the lectures the student will be presented with the background associated with the module and will apply the theory to solving problems. The praticals will be used to elucidate the theory presented in lectures.

Assessment Strategy

The knowledge the learner obtains will be assessed via a combination of formal exams, projects and praticals quizzes. The praticals and projects are designed to develop the engineering problem solving skills of the learner through hands on learning, thereby consolidating the background information presented formally in the lectures.

Repeat Assessment Strategies

A repeat exam will be available in autumn which will cover the percentage of marks obtained in the summer terminal exam. The marks obtained in the coursework throughout the year cannot be repeated via a repeat autumn examination and thus will be carried forward from the previous attempt.

Additional Facilities

-

Indicative Coursework and Continuous Assessment:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Practical Evaluation Laboratory	20 %	OnGoing	1,3,4,5,6,7
Assessment	Class Assessment Written examination	20 %	OnGoing	1,2,3,4,5,6,7

End of Semester / Year Formal Exam:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam Written examination	60 %	End of Term	1,2,3,4,5,6,7

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	lecture	Lecture Theatre	2	Weekly
Practical	Laboratory	Engineering Laboratory	2	Weekly

Literary Resources

Physics, Cutnell and Johnson, Wiley, 2010.

Engineering Mechanics, R.C. Hibbeler, S.C.Fan, 14th Edition, 2016

Other Resources

Lecture notes

Laboratory sheets

Worksheets

Programme Membership

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ENVI06021 2023
Sustainability in Industry

Mandatory Delivered in Stage 1 Year Long

Full Title	Sustainability in Industry		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		
Co Authors	David Mulligan		

Module Description

This module will give the students an overview of sustainability in industry and the challenges that industry need to address especially with the Sustainable Development Goals and the various strategies for achieving these. This module will also outline the circular economy and the impact this has on design, innovation and manufacturing requirements.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	List the sustainable development goals (SDGs) and explain their impact on the manufacturing industry.
2.	List the main contributors to air and water pollution in industry and describe strategies to reduce pollution and conserve water.
3.	Describe the impact of green house gases (GHG) on the environment and list the main sources of GHG.
4.	Describe the different strategies for electrical and thermal energy generation and their impact on the sustainable development goals.
5.	Explain how good design practices can contribute the SDGs.
6.	Explain the role of product lifecycle management in attaining the SDGs, and describe strategies for disassembly and disposal of a product.
7.	Explain the requirements of environmental legislation, in particular ISO14064-1
8.	Research end-of-life options for components of a product and prepare documentation for the disassembly of the product and appropriate disposal of its components.

Indicative Syllabus

Sustainable development goals

- Context
- The 17 goals with special consideration on the role of industry in meeting the goals.

Green house Gases and their impact on the environment

- Main sources a Green House Gases
- Impact on their environment
- Strategies for reduction of the gases

Air pollution and effect on health

- NO_2, NO_X, SO_2, Lead, PM_{10}, CO, VOC, Benzene, O_3
- Main sources
- Effect on health
- Strategies to reduce air pollution

Water pollution

- Sources of water pollution
- Strategies to reduce water pollution

Water conservation

- Strategies to reduce water consumption

Electrical energy generation

- Technologies used to generate electricity
- Impact on the environment of electrical energy generation
- Strategies to reduce the impact on the environment

Thermal energy generation

- Technologies used to generate thermal energy
- Impact on the environment of electrical energy generation
- Strategies to reduce the impact on the environment

Product Environmental life cycle assessment (LCA)

- Product life cycle stages
- Possible impact on the environment of each of the stages
- Carbon Neutrality
- Circular Economy
- Good design practices - design for sustainability

Industry and sustainability

- Ethics and corporate responsibility (case studies where lack of ethics resulted in negative impact in environment.
- Standards ((including ISO14064-1)
- Regulation, Legislation

Teaching and Learning Strategy

The teaching and learning strategy will induce tutorial and project work. Flip classroom will be used for the theory and the tutorial hours will be used to look at case studies and discuss the topics. Students progress will be assessed by online quizzes. For the project students will dissect products and research the opportunities to re-use or re-cycle the components. They will then prepare a disassembly guide and propose changes to the product that would reduce its negative impact on the environment.

Assessment Strategy

An end of term exam will assess the theoretical knowledge acquired throughout the module. Students will prepare portfolio work on some of the topics that they will present to their peers. Finally, they will prepare disassembly guides.

Repeat Assessment Strategies

Students can re-submit the portfolio and guides. A repeat exam will be offered in autumn.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assignment	Portfolio	20 %	OnGoing	1,2,3,4,5,6,7
Group Project	Disassembly of products	20 %	OnGoing	6,8
Multiple Choice/Short Answer Test	Online quizzes	10 %	OnGoing	1,2,3,4,5,6,7

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final exam	50 %	End of Year	1,2,3,4,5,6,7

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Tutorial	Tutorial	Flat Classroom	1	Weekly
Practical	Dissection	Engineering Laboratory	2	Weekly

Programme Membership

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CIVE06109 2023
Computer Aided Design -2D

Mandatory Delivered in Stage 1 Semester 1

Full Title	Computer Aided Design -2D		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

In this module the student will be introduced firstly to the basic CAD interface, then to a range of the more common CAD tools and commands, culminating in the production of a set of house plans to a professional level.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Apply practical skills in the area of Computer Aided Drawing
2.	Represent graphically the development and refinement of problem solving ideas
3.	Illustrate ideas and solutions to problems, using acceptable drawing conventions, symbols and standards for presentation
4.	Demonstrate ideas and solutions in a clear, unambiguous manner
5.	Identify the commands associated with the efficient production of drawings for construction
6.	Apply the knowledge of drawing conventions
7.	Interpret what is represented graphically and extract what information is needed from a drawing

Indicative Syllabus

Technology

Facilitate the learner to:

- examine hardware and software associated with Computer Aided Draughting
- identify any health and safety risks associated with this technology and suggest possible solutions

Explore with the learner the benefits of Computer Aided Draughting as a design tool, and

- compare with traditional methods of draughting
- suggest advantages and disadvantages of both modern and traditional methods

Facilitate the learner to interpret the software's user interface and the terminology associated with the same

- explore options available c
- ustomise settings
- restore defaults

Draughting

Facilitate the learner to utilise appropriate techniques in order to create two dimensional objects, to include:

- lines
- polylines
- splines
- arcs
- circles

Facilitate the learner to utilise appropriate techniques in order to modify two dimensional objects, e.g:

- trim
- extend
- offset
- mirror
- fillet
- move
- copy

Facilitate the learner to apply a range of techniques aimed at increasing the efficiency of drawings, to include:

- blocks
- layers
- templates

Presentation

Facilitate the learner to utilise a range of techniques to increase the quality of the presentation of drawings, to include:

- hatching
- text
- dimensions
- line-types
- line-weights
- colours
- scales

Facilitate the learner to employ appropriate techniques to prepare drawings for plotting e.g:

- page set-up
- page layout
- plotter set-up

Teaching and Learning Strategy

A combination of lectures, tutorials and workshops

Assessment Strategy

Continuous Assessment

Repeat Assessment Strategies

Repeat Project

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Class Assessment class exercises, homework, in-class examination	70 %	OnGoing	1,2,3
Project	Project	30 %	End of Semester	4,5,6,7

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	Laboratory	Computer Laboratory	4	Weekly

Required Reading Book List

Gindis, J., Kaebisch, C., (2020). *Up and Running with AutoCAD 2021*. Academic Press.
ISBN 9780128231173 ISBN-13 0128231173

Literary Resources

Introduction to AutoCAD by Alf Yarwood (current edition)

Online Resources

Moodle site for module

YouTube Channels

Microsoft Teams Channels with Tutorials

Other Resources

Lecture notes and tutorial exercises

Programme Membership

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COMP06087 2023
ICT and professional skills

Mandatory Delivered in Stage 1 Semester 1

Full Title	ICT and professional skills		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		
Co Authors	Jade Lyons		

Module Description

The aim of this module is to empower students with the skills to be successful in third level education and the workplace. This module focusses on areas such as creative thinking, problem solving, communications, innovation, ICT (Microsoft Office and programming) and presentation skills. In addition, the module will explore the challenges faced by ICT systems, including cybersecurity and sustainability. Students will learn how to identify and mitigate potential risks associated with cybersecurity and understand the importance of implementing sustainable practices in ICT systems.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Apply the basic principles of critical thinking/problem solving to engineering systems
2.	Demonstrate an enhanced capacity to communicate in contexts relevant to an engineering environment
3.	Demonstrate basic information and communication technology skills such as the use of hardware, software, and Internet.
4.	Demonstrate proficiency in using common software applications such as word processors, spreadsheets, and presentation tools.
5.	Explain the challenges faced by ICT systems including cybersecurity and sustainability.

Indicative Syllabus

The Engineering Academic Environment: Code of conduct; Learning at third-level;learning styles; independent learning; programme syllabi, assessment types; learning supports, Moodle, PASS, Maths Learning Centre, Academic Writing Centre

Problem Solving Skills : Conceptual approaches to problem solving; brainstorming - process methodology and technique; lateral thinking; the iterative process

Group Work and Team Skills Development: Group structures and roles; problem based learning; performance assessment in group work; forming, storming, norming and performing; conflict and how to deal with it.

Communication/ Social Skills: Communication Theory; modes and types; written English - basic grammar, sentence structure; document design. Excel, data presentation. Formal communications, emails and social media. Public speaking, visual communication aids, presentation skills. Negotiating skills, gender and ethnic issues.

Ethics: the definition of a profession, the ethical requirements of a profession, the public safety directive; Intellectual property, plagiarism, conflicts of interest.

Applied Software Skills: using Word, Excel, Powerpoint proficiently, understanding databases

Cybersecurity challenges: Threats to data and information security such as hacking, malware, phishing, and social engineering.
Importance of implementing security measures such as firewalls, antivirus software, and encryption

Sustainability challenges: Increasing energy consumption and carbon footprint of ICT systems. Disposal of electronic waste and the need for proper recycling. Environmental impact of data centres and server farms. Importance of implementing sustainable practices such as energy-efficient hardware and data centre design.

Teaching and Learning Strategy

Module material will be addressed by online lectures, tutorials and forums.

On-line learning resources wil be referenced, with MCQs associated, some formative, some summative.

Assessment Strategy

Assessments will include: on-line MCQs; engagement with on-line learning resources; collaborative learning; presentation and report on a given topic.

Independent learning - workbooks, on and off-site investigation, experimentation, contextual research, library and online research and reading.

Upon commencement of the module, the assessment criteria detailing how marks are allocated as the semester progresses will be fully explained to all students and published on Moodle.

Module Participation (10%) – marks based on engagement and participation in online activities, workshops and group critiques.

Continuous Assessment (90%) – These will include a portfolio of completed studio and workshop projects. Other assessments will include projects which are completed using different research methodologies. Each assessment will have a briefing document outlining the task set for the student and the marking criteria thus ensuring students understand what is required of them and how marks are allocated.

Repeat Assessment Strategies

100% repeat portfolio & Workbook assessment at autumn exam sitting.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Practical Evaluation	Module Participation	10 %	OnGoing	1,2,5
Multiple Choice/Short Answer Test	Engineering ethics	10 %	Week 7	1,3
Group Project	Group assignment	20 %	Week 13	1,2,4
Assignment	Presentation skills	20 %	Week 20	1,2,4
Assignment	Portfolio	40 %	Week 26	1,2,3,4,5

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	Practical	Computer Laboratory	3	Weekly

Online Resources

Other Resources

The module Moodle page.

Programme Membership

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Atlantic Technological University

MECH06034 2023
Introduction to Manufacturing Engineering

Mandatory Delivered in Stage 1 Semester 1

Full Title	Introduction to Manufacturing Engineering		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module introduces the learner to manufacturing engineering and their impact on sustainability. Students will get a basic introduction to materials and material processing technologies which will allow them to identify the right material and process for a given product while considering the environmental impact. They will also get an introduction to the basic skills of manufacturing.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Associate manufacturing processes to the material processed and the shape required.
2.	Apply appropriate safety procedures and good practices in a manufacturing environment.
3.	Interpret engineering drawings in order to manufacture and assemble artefacts to the desired specification.
4.	Identify the environmental impact of manufacturing processes.

Indicative Syllabus

LECTURES

Materials and Biomaterials

- Mechanical Properties of Engineering materials.
- Physical Properties of Engineering materials.
- Impact on the environment

Metal processing

- Metal cutting
- Heat Treatment
- Materials joining
- Impact of metal processing on the environment

Polymer processing

- Extrusion
- Polymer blend preparation, mixing
- Moulding and press-moulding
- Injection moulding / blow moulding
- Thermoforming
- Impact of polymer processing on the environment

Non-traditional manufacturing processes:

- EDM: Solid die sinking and wire erosion
- EBM: Electron beam machining
- Abrasive water-jet machining
- Laser machining
- Chemical machining
- Ultrasonic machining
- Water-jet machining
- Rapid Prototyping
- Impact of these processes on the environment

MANUFACTURING PROJECT
1. Health & Safety
2. Introduction to safe operation of basic manufacturing equipment.
3. Introduction to Process planning. The process planning of components.
4. The integration of manufacturing engineering processes to manufacture artefacts to specification in an engineering workshop.

Teaching and Learning Strategy

The lecture will cover the basics of materials and material processing technologies and their impact on the environment. Some of the knowledge will be acquired through videos or personal research. The workshop element will give students a basic introduction to working in a workshop environment with health & safety constraints.

Assessment Strategy

Moodle quizzes to highlight the information extracted from personal reading or videos. (10%)

Exam to assess the knowledge acquired (50%).

Project where students will manufacture a mechanical system using various manufacturing processes and prepare a reports detailing the environment impact of the manufacturing process used. (40%).

Repeat Assessment Strategies

A repeat exam will be available in autumn which will cover the percentage of marks obtained in the non-workshop assessments which are worth 50% of the total marks. The marks obtained in the workshop praticals throughout the year cannot be repeated and thus will be carried forward from the previous attempt.

Additional Facilities

None

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Written Report/Essay	Environmental impact of manufacturing process	10 %	End of Semester	1,2,4
Multiple Choice/Short Answer Test	Moodle Quizzes	10 %	OnGoing	1,2,3,4
Skills Evaluation	Artefacts manufactured	30 %	OnGoing	2,3

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Exam	50 %	End of Year	1,3,4

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	lecture	Flat Classroom	1	Weekly
Practical	Practical	Engineering Laboratory	3	Weekly

Recommended Reading Book List

Groover, P., (2010). *Principles of Modern Manufacturing: SI Version*. John Wiley & Sons Ltd.
ISBN 0470505923 ISBN-13 9780470505922

Black, J., (2012). *Degarmo's Materials and Processes in Manufacturing: International Student Version* . John Wiley & Sons Inc.
ISBN 0470873752 ISBN-13 9780470873755

Black, J., *Workshop Processes, Practices and Materials*. Butterworth-Heinemann Ltd.
ISBN 0713134097 ISBN-13 9780713134094

Kalpakjian, S., (2007). *Manufacturing Processes for Engineering Materials (5th Edition)*. Pearson.
ISBN 0132272717 ISBN-13 9780132272711

Smyth, L., *New engineering technology*. Educational Company, Engineering and Technology Teachers' Association.
ISBN 0861674480 ISBN-13 9780861674480

Literary Resources

REQUIRED READING:
Class notes

Online Resources

Caluating speed and Feeds :http://www.custompartnet.com/calculator/turning-speed-and-feed

ISO LImits and Fits : http://www.amesweb.info/FitTolerance/FitTolerance.aspx

Understanding machince operations: http://itdc.lbcc.edu/oer/machineTool/machiningOperations/machiningOperationsALT/machiningOperations.htm

Other Resources

None

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

MECH06033 2023
Computer Aided Design -3D

Mandatory Delivered in Stage 1 Semester 2

Full Title	Computer Aided Design -3D		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

Computer Aided Design is a 3-hour weekly computer lab that introduces students to 3D modelling and creative design process through the use of CAD software.

Computer Aided Design teaches the fundamental principles of technical drawing and modelling through an active learning environment where students are required to complete weekly assignments and also a design-and-build project at the end of each semester.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Use three dimensional solid modeling software in the design of engineering components.
2.	Apply engineering graphics standards.
3.	Use various technical commands and be able to select the appropriate methodology (design intent) required for the creation of a solid model.
4.	Create drawing files displaying orthographic layouts from the solid model as well as dimensioning and applying dimensional and geographic tolerances to the drawing file.
5.	Select and use the optimum software techniques to create parts and assemblies models.
6.	Use standards parts libraries for the selection of appropriate standard components in the design / assembly process.

Indicative Syllabus

Sketch mode: sketcher environment, user interface, menus, modes, working directory, entering commands, units, changing units, sketcher toolbar, mouse functions. 2D sketching primitives, lines, circles, rectangles, polygons, arcs, fillets, splines, points, text. Editing entities, mirroring entities, trim and divide, creating and modifying dimensions, strong and weak dimensions, converting weak dimensions into strong dimensions, centrelines, construction circles, help menu. Graded exercises to apply above commands and functions.

Sketch mode: design intent - implementation of intent manager - on and off modes, geometric constraints, tangency, co linearity, symmetry, equal length or radius, parallelism, horizontal and vertical, perpendicularity, alignment. Disabling constraints, converting weak constraints into strong constraints, over and under constrained sketches, resolving sketches, Scaling, rotating and copying entities, Importing 2D drawings in the sketch mode. Graded exercises to apply above commands and functions.

Solid mode: protrusion: part name, creating datum planes - reference planes and sketch planes, co-ordinate systems, extrusion dashboard, creating simple and sketched holes, cuts, chamfers, fillets, ribs, drafts. Editing definitions/references and regenerating the model. Deleting features, model tree, view and display commands, model colour, creating new work-planes, mirroring and copying in solid mode.

Drawing standards: ISO 128 (BS 8888) drawing standard, alternative standards, sketching in 2D and 3D, sheet sizes and layout - title blocks, abbreviations: as given in ISO 128. Terminology used to describe features of engineering components - ribs, boss, undercut etc. Conventions: methods of representing engineering components as presented in ISO 128-screw threads, gears.

Solid mode: revolved solids, revolved cuts, rectangular and rotational patterns, uni and bi-directional patterns. Patterns of grouped features. Child/parent relationships, implicit and explicit. Layers as organisational tools, creating and assigning items to layers. Suppressing and hiding items. Graded exercises to apply above commands and functions.

Orthographic projection: theory of first and third angle projection, sections and part sections, exceptions allowed in sections, hidden detail, dimensioning according to ISO 128, application of toleranced dimensions. Graded exercises to apply the principles of orthographic projection, sectioning and dimensioning.

Drawing mode: extracting orthographic layouts from the solid model, dimensioning the views, adding 3D views, inserting layout sheets, creating text.

Sweeps: closed section- open trajectory sweeps. Open section - closed trajectory sweeps. Thin sweep protrusions. Swept cuts.

Blends: parallel - rotational and general options. Shell options -constant and variable thickness.

Printing: print hard copy

Assembly modelling: assemble parts as a mechanical assembly, assembly constraints - mate, offset, align etc. Checks for clearance and interference; Subassemblies, assembly display management, exploding assemblies, assembly display management. Part creation and editing in assembly mode. Assembly drawings, exploded views, bill of materials,

Parts created in earlier lessons can be used for assembly mode. Engineering drawing theory: assembly drawings: exploded views. Advanced blends, sweeps and splines: helical and variable section sweeps Welding symbols: BS 499, application of the symbols used to indicate welds and weld preparation.

Customisation: interface customisation tools; configuration files.

Standard parts library: use of electronic parts libraries for standard components.

Parametric modelling: parametric equations, creating relationships between dimension values, conditional relationships, implications of design intent. Incorporating design intent by establishing relationships between dimensions. Design table spreadsheets.

Creating assemblies using local or online standard-parts libraries or commercial catalogs.
Graded exercises to apply above commands and functions

Teaching and Learning Strategy

CAD is taught in in a computer lab to a small cohort of students . Small group learning can be of great benefit when trying to promote active learning, critical thinking, creativity and life skills in general. Understanding many aspects of CAD cannot be achieved through the inactive practice of listening. Students must actively practice the techniques involved, discuss alternative methods and get feedback from as many sources as possible. Small group learning encourages these activities as well as introducing students to a more collaborative learning environment as opposed to the traditional competitive environment and helping students improve the real world skills required by companies.

The teaching strategy focuses on three main areas, namely, outlining the objectives of each three hour class, analysing the teaching method (involves both students and lecturer) and the role of the lecturer.

The teaching method is as follows:
A Class plan is presented to students at the start of each class. This plan outlines the drawing/modelling techniques to be covered during that specific class.

Each drawing/modelling techniques is demonstrated in class (through the use of lecturer demonstration with the projector), after which the students are required to complete one or more exercises focusing on practicing this technique.

Once the students are satisfied with their understanding of each new drawing/modelling technique they are given a set of exercises/problems to complete which relate to this learning. Students are required to pratice these techniques outside their formal contact hours in order to finish their exercises.

Students who miss class can access all notes relating to each class on Moodle. It is always recommended to students that they attend class as notes on Moodle are no substitute to the valuable learning experience they gain from actually being in attendance.

Problem solving helps cultivate deeper learning. When presented with a problem (mathematical / research / programming) students are immediately presented with a goal and something to work towards.

Apart from the advantages of problem setting and solving in encouraging a deeper learning this method of learning is a critical factor in advancing the competitiveness of people and their ability to meet the challenges of the workplace. Using problem solving can help in fostering communication skills (when working in groups), teamwork skills and a strong work ethic. All of these attributes are important factors in the development and preparation of people who are about to enter the workforce.

Assessment Strategy

CAD is 100% continuous Assessment. Students are required to complete a set of exercises each week. These exercises relate to a specific topic which is covered in class that week. Students received prompt feedback relating to their weekly exercises, thus helping them understand very quickly where their competence and weakness lies. This method of assessment also allows the lecturer to follow the progress of each individual student more closely

Repeat Assessment Strategies

Students who fail CAD have the opportunity to repeat by means of a three hour exam in
September.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	CAD Exercise	100 %	OnGoing	1,2,3,4,5,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	Practical	Engineering Laboratory	4	Weekly

Recommended Reading Book List

Tickoo, P., (2015). *PTC Creo Parametric 3.0 for Designers*. CADCIM Technologies.

Online Resources

https://learningexchange.ptc.com/

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ENER06008 2023
Electrical Science

Mandatory Delivered in Stage 1 Semester 2

Full Title	Electrical Science		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module will cover the fundamental principles of electrical science. Students will learn to analyse, design, build and troubleshoot basic electric and instrumentation circuits through both theory and practical applications.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe and define basic electrical, magnetic and other relevant physical quantities and perform fundamental calculations in relation to these quantities.
2.	Describe the basic principles of electricity generation and perform DC and AC energy and power calculations.
3.	Explain the technology and use of common electrical and electronic components, sensors and actuators and how these components are utilised in basic circuits.
4.	Specify, select, build and troubleshoot basic electrical and instrumentation circuits using appropriate measuring equipment while applying appropriate health and safety principles

Indicative Syllabus

Electrical Health & Safety.

SI system, prefixes, scientific and engineering notation.

Electric charge, voltage, resistance and resistors as components; measurement of basic electrical quantities.

Ohm's Law, DC energy and power calculations.

Kirchoff's Laws and analysis of DC networks: series, parallel and series-parallel circuits; software simulation of circuit operation.

Magnetism and Electro-magnetism; Electromagnetic devices: e.g.motors and generators, switches, relays, sensors etc.

Alternating current and voltage

Capacitors in DC and AC systems

Inductors in DC and AC systems

AC energy and power calculations

Design and prototype basic circuits

Basic electrical measurements

Teaching and Learning Strategy

The module is divided in lectures and practicals. In the lectures, students learn the fundamentals of electrical science and methodologies used in the analysis of basic electrical and electronic circuits. In the practicals, students learn to measure basic electrical quantities and to assemble basic electrical and instrumentation circuits by selecting and interconnecting appropriate components.

Assessment Strategy

Students' knowledge of the fundamentals of electrical science as well as their ability to analyse basic circuits will be assessed by a series of continuous assessments (i.e. on-line quizzes), mid-module written assessment and end of year written exam.

Students' ability to design and build circuits and to perform electric measurements and interpret the results will be assessed via practical assignments. These are divided in task based practicals and projects. In some cases, online quizzes are used to assess their understanding of the tasks completed, in other cases students are assessed directly on completion of a particular task or based on reports submitted in relation to the practical work carried out.

Repeat Assessment Strategies

A repeat exam will be available in autumn which will cover the percentage of marks obtained in the summer terminal exam. The marks obtained in the coursework throughout the year cannot be repeated via a repeat autumn examination and thus will be carried forward from the previous attempt.

This module can only be repeated by Repeat and Attend.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Multiple Choice/Short Answer Test	Quizzes	20 %	OnGoing	1,2,3,4
Practical Evaluation	Practicals	20 %	OnGoing	2,3,4
Group Project	Project	10 %	TBA	4

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Final Exam	50 %	End of Semester	1,3,4

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	lecture	Tiered Classroom	1	Weekly
Practical	lab	Engineering Laboratory	3	Weekly

Recommended Reading Book List
Floyd, T., Buchla, D., (2021). *Principles of Electric Circuits: Conventional Current*. ISBN 1292358092 ISBN-13 9781292358093
Floyd, L., (2013). *Principles of Electric Circuits: Pearson New International Edition*. ISBN 1292025662 ISBN-13 9781292025667
Floyd, L., Buchla, M., (2010). *Electronics Fundamentals*. ISBN 0135096839 ISBN-13 9780135096833

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

CIVE06110 2023
Construction Technology and Building Services

Mandatory Delivered in Stage 1 Semester 2

Full Title	Construction Technology and Building Services		
Status	Approved by Academic Council	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module introduces learners to the materials, methods and technologies involved in the design and construction of residential buildings using traditional masonry cavity walls and timber framed construction. All stages of construction are dealt with from foundations up to roof level along with drainage, wastewater treatment, access and planning. There is a particular emphasis on sustainable methods of construction.

The Building Services Hour will introduce the student to the basics of water, space heating and electrical power services for buildings, but services design will only be covered insofar as it is necessary for safety awareness.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe all stages in the construction of a traditional masonry cavity wall and a timber framed domestic dwelling.
2.	Describe and Sketch typical construction details in the design of a domestic dwelling for nZEB and all relevant Building Regulation compliance.
3.	Assess building construction details for compliance with the Building Regulations, TGD, Parts A - F, H, L and M.
4.	Explain concepts fundamental to building services.
5.	Detail relevant health and safety considerations of the above services.

Indicative Syllabus

CONSTRUCTION TECHNOLOGY

Building Regulations: Introduction to Building Regulations & Technical Guidance Documents, Building Control Amendment Regulations, Declaration of Performance, CE Mark, Agrément Certificate, Assigned Certifier

Site Investigations:

Desk studies; visual assessment/walk over studies, direct investigation; trial hole and boreholes, soil classification, water table.

Foundations:

Bearing capacity of soils; selection and type including strip and raft foundation; form work, rising wall construction; setting out of foundation - line and level.

Ground Floors:

Selection and type of ground floor including concrete ground supported floors, suspended timber ground floors, suspended precast concrete ground floors; damp control; thermal insulation; reinforcement in concrete ground floors, Acceptable Construction Details, ACD's.

Radon:

Definition; how it affects people; building regulations requirements; performance requirements; methods of detection and measurement; construction details.

Wall Construction:

Lintels; external wall construction; thermal insulation; damp proof courses; changes in roof level; movement joints; party wall construction; piers and openings; external and internal rendering and finishes, ACD'S.

Fireplaces and Chimneys:

Dimensions of openings; recesses; fireplace construction; height and width of chimneys; damp proof courses.

Upper Floors and Partitions:

Sizing floor joists using EC5; upper floor construction including precast concrete and timber; floor decking; partitions; load bearing partitions; thermal insulation, fire resistance; trimming around stair openings

Stairways and Steps:

Rise, going, ramps and guards; dimensions of stairs; guarding requirements; timber, in-situ and precast concrete stair construction.

Roofs:

Prefabricated roof trusses; traditional cut-roof construction; dormer and storey-and-a-half construction; roof ventilation; lean-to-roofs; canopies; flat roofs warm and cold

deck construction; sizing roof timbers using EC5; roof tiling and slating; flashing and gutters, ACD's.

Windows and Doors:

Window types and selection; glazing; day-lighting; ventilation requirements; thermal insulation; sound insulation; internal and external door types and selection; fire rated doors; fittings and fixtures; door and window schedules.

Timber Frame Construction:

Construction guidelines; accuracy of setting out; rising walls and foundations; ground floor construction; preservative treatment; external walls; party walls; internal walls; upper and party floor construction; roofs; cladding systems; fire performance; thermal performance; acoustic performance; services ACD's.

Ventilation Requirements of Buildings:

Ventilation requirements; condensation; mould growth.

Fire Performance:

Means of escape; wall and ceiling linings; fire resistance; roof coverings; fire fighting access; radiation onto boundaries; roof-lights; flue pipes; hearths.

Accessibility Requirements:

Residential building requirements; approach to a dwelling; flexible and rigid road construction access into a dwelling; circulation within a dwelling; sanitary conveniences; fixtures and fittings.

Sustainable Construction:

nZEB: Conservation of fuel and energy; Minimisation of thermal bridges, Continuity of insulation and Airtightness membrane, ACD's, Energy Performance of Buildings Directive (EPBD); Building Energy Rating (BER) for new residential buildings; air permeability pressure testing; PassivHaus specification.

BUILDING SERVICES

Introduction to Building Services

Various types of Mechanical, Electrical, Transportation and Specialist services.

Services expenditure in context of project budget. Building Services and Energy in EU.

SI system of units. Fundamental, supplementary and derived units.

Introduction to Mechanical Services (Water)

Mains water supply; rainwater harvesting.

Sanitary ware; Cold water: Storage and supply arrangements;

Fluid Pressure. Derivation. Various units of measurement. Conversions.

Centrifugal Pumps. Pressure-Flow characteristics. Parallel and Series operation

Cold water: Storage and supply arrangements. Flow equation. Reclaimed water including Rainwater Harvesting systems

Hot Water: Specific heat capacity. Water heating and calorifiers. Solar water heatring.

Supply; Building Regulations TGD G "Hygiene";

Legionnaire's disease: background, risks and avoidance strategies; hot water storage and return systems;

Wastewater and sewer gases; drainage systems; health and safety considerations; Leptospirosis; design of above-ground soils and wastes installations; unventilated and ventilated installations; Building Regulations TGD H "Drainage" (above ground).

Introduction to Space Heating services.

Welded Steel Boilers and fuel storage arrangements; natural, forced and induced draught;

Gun type burners; heat emitters; radiators; convective circulation; single pipe, two-pipe and reversed return LPHW heating systems.

Heat pumps including ground source, air source and others.

Underfloor heating.

Introduction to Electrical Theory and Practice

Introduction to Electricity. Voltage, current and resistance. Ohm's Law.

The power equation. Direct and single-phase alternating current.

Basic Electrical installation: consumer units, socket circuits, lighting circuits, fixed appliances

Teaching and Learning Strategy
Two hours per week of formal lecture for ConstructionTechnology One hour per week of formal lecture for Building Services

Assessment Strategy
Continuous assessments, project and assignments during the year where students are assessed on material covered on a continuous basis.

Repeat Assessment Strategies
Written evidence must be provided to the lecturer and to class tutor to explain reason for absence. If the reason is considered valid, the student will be offered the opportunity to repeat the assessment.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***

Assessment	CT Assessments	20 %	OnGoing	1,2,3
Assessment	CT Projects	15 %	OnGoing	2,3
Project	BS Assessment	7 %	OnGoing	4
Project	BS Project	8 %	Any	5

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	50 %	End of Term	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Flat Classroom	4	Weekly

Recommended Reading Book List

Corcoran, E., King, S., Nolan, W., (2013). *Get Constructive*.
ISBN 1908507969 ISBN-13 9781908507969

Chudley, R., Greeno, R., (2006). *Building Construction Handbook*. Routledge.
ISBN 9780750668224 ISBN-13 0750668229

Fleming, E., (2005). *Construction Technology*. Wiley-Blackwell.
ISBN 1405102101 ISBN-13 9781405102100

Riley, M., Cotgrave, A., (2013). *Construction Technology*.
ISBN 1137030178 ISBN-13 9781137030177

McMullan, R., (2017). *Environmental Science in Building*. Red Globe Press.
ISBN 9781137605443 ISBN-13 1137605448

Oughton, D R., Hodkinson, S., (2008). *Faber & Kell's Heating and Air-conditioning of Buildings* . Routledge.
ISBN 9780750683654 ISBN-13 0750683651

Steward, E., Stubbs, T A., (2005). *Modern Wiring Practice*. Newnes.
ISBN UOM:39015058742381

Bolton, W., (2020). *Engineering Science*. Routledge.
ISBN 0367554453 ISBN-13 9780367554453

Of, E., (2021). *National Rules for Electrical Installations* . 3rd Edition. Electro-Technical Council of Ireland.

Online Resources

Technical Guidance Documents | Department of Housing, Local Government and Heritage (old.gov.ie)

seai.ie

https://vleweb.ccn.ac.uk/constructionweb/index.htm

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

Stage 2 Modules

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ENER06004 2022
Renewable Energy Technologies

Elective Delivered in Stage 2 Year Long

Full Title	Renewable Energy Technologies		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	06	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Willie Geraghty		
Co Authors	Carine Gachon, PJ McAllen, Oliver Mulryan, Michelle McGuinness		

Module Description

Learners will develop an understanding of the consumption patterns and availability of fossil fuels in a national and global setting. Learners will be introduced to the nature and availability of solar radiation and develop a thorough knowledge of some solar technologies used to maximise the potential of this resource, including solar thermal and solar photovoltaic. Learners will develop an understanding of the fundamentals of wind energy generation and installation, as well as the fundamentals of heat pump design, operation, and installation.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Appreciate the drivers causing environmental change and associated environmental policy
2.	Identify conventional energy resource availability and consumption trends.
3.	Explain the fundamentals of solar radiation and the operation, installation and economics of associated energy transfer systems
4.	Understand the fundamentals of wind energy and microscale wind turbine operation and installation
5.	Critically evaluate the operation, installation and economics of heat pump and air conditioning systems
6.	Apply building information modelling software to assess the performance and operation of solar, wind and heat pump systems.

Indicative Syllabus

Energy Resources and Solar

Introduction to energy resources and the life cycle analysis of fossil fuels. Irish energy statistics and consumption trends. Introduction to solar thermal systems, technologies and their installation practice. Fundamentals of silicon solar cell technology and materials. Production of crystalline silicon. Fundamentals of thin film cell technologies. Introduction to advance solar cells and materials. Introduction to Solar PV system design and installation.

Wind

Review of Fundamentals: Origin of wind; temperature gradients and air circulation; Coriolis force; Global and local winds; mountain winds. Energy in the Wind: Air density and rotor area; air pressure distribution; anemometers; wind speed measurement practice and data logging; local wind rose. Turbine siting: roughness and shear; wind speed calculations; Wind speed variability; Turbulence, obstacles and shade; Wake, park, tunnel and hill effect; local influences on turbine location; Offshore wind farms; European and Irish wind maps; planning authority requirements. Energy Output: Weibull distribution; distribution plotting; Average Bottle Fallacy; Mean wind power; Betz' law; Power density, power curves and power coefficient; annual energy output. Turbine Operation: Lift; Stall and drag; sum of wind speeds; Rotor aerodynamics; Rotor blade design; power control of wind turbines; yaw mechanisms; Towers and tower design; wind turbine selection; Safety; Installation Techniques. Generators: Generator fundamentals; Synchronous Generators; Asynchronous Generators; Variable Slip Generators, Indirect Grid Connection; Gearboxes, Controllers, Power quality. Turbine Design: Structural Dynamics; Horizontal/Vertical; Upwind/Downwind; Number of rotor blades; Turbine optimisation; Turbine noise (mechanical and aerodynamic); Blade testing; small wind technology. Wind Energy and the Electrical grid: Variations in Energy; Seasonal variations; Power quality; Embedded generation and wind turbines; Impacts of wind turbines on electrical supply networks; Network issues - frequency control, voltage control, fault levels; Quality of supply issues associated with wind turbines; Control of network interface; Supervisory control; Backup supply; Energy storage; Integration with other energy sources - Hybrid systems. Turbines and the Environment: Landscape and Turbines; Sound and sound measurement; Shadow casting. Economics: Turbine costs; installation; operation and maintenance; Income from wind energy; Tariffs, economics of wind energy and pitfalls in cost analysis; survey of existing machines and their performance.

Heat Pump

Ecological and Economic Issues of Heat Pump Technology: Explain the main reasons for specifying heat pumps with convincing arguments; Advise customers on investment costs and pay back period of heat pumps in comparison with other common heating methods; Demonstrate knowledge of the energy market; Evaluate local and regional conditions and influences on ground water; Outline national regulations in respect of heat pump sources; Explain the interactions between the building and the heat pump system; Recognise the relationship between low temperature floor heating/ wall heating systems and thermal comfort; Describe controlled building ventilation. Principles of Heat Pump Technology: Outline the physical principles and thermodynamic cycle concerning heat pumps; Explain the operating principles of a heat pump; Explain the characteristics of the heat pump cycle; Determine the coefficient of performance (COP) and seasonal performance factor (SPF); Identify and explain the functions of all various components within the heat pump; Explain the lubricating oil function within the cycle and associated problems; Explain the refrigerant function and characteristics within the heat pump cycle; Explain superheating and sub-cooling. Site Assessment, Design and Sizing of Heat Pumps:

Calculate building heat and cooling load; Calculate building heat load for hot water production; Determine the capacity of the heat pump; Review potential heat sources and suitable types of heat pump systems; Determine size of heat source collector to meet building load requirements; Identify and assess any site-specific constraints and determine the best location for the heat pump. Heat Distribution, Integration and Controls: Identify the differences between safety requirements for heat pumps and conventional systems; Define the supply temperatures and factors which influence supply; Describe hydraulic integration design for a variety heating systems; Outline safety concerns of hot water production with heat pumps; Distinguish between the various operating methods of a range of heat pump systems; Determine the most suitable control strategy depending on the hydraulic system and on the building. Installation and Commissioning: Determine additional components required for a heat pump system; Install typical auxiliary and monitoring components as required by design choices; Carry out leakage pressure test of the heating system and heat source; Commission a system and balance the mass flow within the heat source and the heat sink; Specify the requirements for the electrical connection, especially with regard to the implications of soft start for heat pumps; Interpret and apply any relevant safety regulations to ensure protection measures for persons and property; Demonstrate the procedures for system operation, basic maintenance and diagnostics; Explain the advantages of carrying out periodical maintenance on the heat pump system; Recognise typical errors and faults and identify methods of fault prevention.

Examples of Assignments and Laboratory Experiments:

- Use of solar thermal laboratory for experiments relating to control and monitoring equipment, hot water storage and the provision and installation of a hydronic system.
- Wind data analysis and resource assessment using wind maps to find statistical wind parameters (e.g. Weibull)
- Economic analysis of a wind energy project
- Blade airfoil design with rapid prototyping
- Calculate the COP of an operational heat pump
- Optimised control strategies for heat pumps
- Demonstrate the procedures for maintaining a heat pump
- Assessment of the influence of soil parameters of heat pump COP
- On campus site visit to operational energy systems

Teaching and Learning Strategy

The module will be delivered using a combination of teaching and learning strategies including: lectures, tutorials, laboratories, in class discussion and self-directed learning.

Assessment Strategy

A blend of final written examination and continuous assessment projects. Laboratory Reports and in-class quizzes to evaluate learning throughout the semester.

Repeat Assessment Strategies

A written repeat written/online assessment will be provided in Autumn.

Additional Facilities

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
UNKNOWN	Practical Evaluation Laboratory work	40 %	OnGoing	2,3,5,6
UNKNOWN	Class Assessment Class Assessment	60 %	OnGoing	1,2,3,4,5,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Tiered Classroom	2	Weekly
Practical	Laboratory	Laboratory	2	Weekly
Tutorial	Tutorial	Flat Classroom	1	Weekly

Required Reading Book List

Masters, M., (2013). *Renewable and Efficient Electric Power Systems* . John Wiley & Sons.
ISBN 9781118633496 ISBN-13 1118633490

Reinders, A., Verlinden, P., van Sark, W., Freundlich, A., (2017). *Photovoltaic Solar Energy*. John Wiley & Sons.
ISBN 9781118927489 ISBN-13 1118927486

Literary Resources

- Ritchie R., Wood Pellets: As a Fuel, Stoves, Buyer's Guide, User's Handbook-All That's Practical, Ritchie Unlimited Publications, 2004. (ISBN-10: 0939656779)
- Trimby P., Solar water heating : a DIY guide, Centre for Alternative Technology Publications; 5th edition, 2008. (ISBN-10: 1902175301)
- Markvart T., Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers, German Solar Energy Society (DGS).
- Hodge B.K., Alternative Energy Systems and Applications, Wiley 2010 (ISBN-978-0-470-14250-9)
- Manwell, J.F. , Wind Energy Explained - Theory, design and application , Wiley 2009 (ISBN: 0-471-49972-2)
- Stoecker W.F. & Jones J.W., Refrigeration and air conditioning, Mcgraw Hill Higher Education, 1983(ISBN 10: 0070665915)
- Ochsner K., Geothermal Heat Pumps: A Guide for Planning and Installing, Mcgraw Hill Higher Education, 2007 (ISBN 10: 0939656779)

Other Resources

Lecture Notes and Practical Handouts

Programme Membership
GA_EENAG_H08 202200 Bachelor of Engineering (Honours) in Energy Engineering GA_EENEG_B07 202200 Bachelor of Engineering in Energy Engineering GA_EENEG_C06 202200 Higher Certificate in Engineering in Energy Engineering (Exit)

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Atlantic Technological University

COMP06079 2023
Cloud and Green Computing

Elective Delivered in Stage 2 Year Long

Full Title	Cloud and Green Computing		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The module introduces the concept of sustainability and its relationship to Green IT. The module critically evaluates technologies that will reduce power consumption and positively impact on the environment. The course covers a range of topics that all contribute to the triple bottom line of people, planet, and profit. The module also introduces the concepts of cloud platform as a service and software as a service. The module also outlines cloud based applications and services from market leaders and reviews key concepts underpinning the role of cloud technologies as found in data centers.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Identify and describe the fundamental technical challenges and requirements of Cloud and Green computing technologies.
2.	Review the green impact of virtualisation for cloud based systems
3.	Identify the business benefits of adopting the cloud as a business strategy from both financial and environmental aspects
4.	Justify the selection of appropriate strategies and technologies for a given set of business goals and requirements
5.	Select and apply appropriate technologies, methodologies and tools to identify and improve the environmental impact of computing taking into account cost, power and services
6.	Demonstrate a responsible ethical approach as computing professionals.

Indicative Syllabus

1. Business Drivers

- Clean Tech Industries
- Green product design
- Hidden costs and gains
- Impact on the environment
- Paradigms and characteristics of cloud systems
- Business advantages and disadvantages of cloud computing
- Business strategies to incorporate cloud computing

2. Green Computing Architecture and Design

- Environmental Impact and Assessment
- Power consumption and energy audit
- Virtualisation and its relation to energy conservation
- Green System Architecture
- Impact of Algorithm design, Runtime and Compiler
- Network & infrastructure in the context of green IT
- Energy impact of cloud and data centres
- Green Data Centres

3. Cloud Systems Architecture and Design

- Packaging of computer resources as a metered service
- Shared instances of infrastructure, application or software as a service
- IAAS, PAAS and SAAS
- Current Products and ‘X’ as a Service
- Security in a cloud based system
- Auditing and Compliance
- Scalability

4. Data Centre Management of Green IT

- Power utilisation and consolidation
- Waste management and Recycling
- Environmental footprint and energy calculation.
- Service management
- Legal, Ethical and Regulatory Issues

5. Future Trends

- Identify and evaluate future trends
- Consider the business advantage of future technologies or processes

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of cloud computing and green IT concepts. Students will work on real-world projects throughout the course, gaining hands-on experience in designing, implementing, and managing cloud-based solutions for sustainable IT practices. This practical experience will help students develop their cloud computing and green IT skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 100% Coursework.

Coursework may comprise a mix of assessment approaches, such as: reports, practicals, presentations, portfolios, class tests, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

Indicative Assessment

The assessments will serve to provide students with a 'hands-on' experience in looking at the pertinent issues facing organisations as they implement and develop new technologies in the area of a data center infrastructure and services. A good grasp on developing/deployment standards will be attained by critically evaluating technologies and processes through assessment work. Sample assignments are indicated below.

Element No	Weighting	Type	Description	Learning Outcome Assessed
1	25%	Environmental Investigations	Each student will produce a investigative report on environmental issues based on practical's/discussions conducted and literature read. This report should outline methods used and draw conclusions	1, 2, 3, 4
2	25%	Green Technology	The student as part of a team will carry out an implementation of a directory service infrastructure on a given a set of user requirements using the tools and techniques demonstrated in class	2, 3, 4
3	25%	Software Solutions 1	Each student will be required to evaluate various X as a Service products given a set of requirements and scenarios. The resultant report should outline methods used and draw conclusions	4, 5, 6
4	25%	Software Solutions 2	Each student will be required to implement IAAS, PAAS and SAAS based solutions given a set of requirements and scenarios. This report should outline methods used and draw conclusions	

Repeat Assessment Strategies

Repeat coursework.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	100 %	End of Semester	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecturers	Not Specified	2	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learning	Not Specified	7	Weekly

Required Reading Book List

Hu, W., Kaabouch, N., (2012). *Sustainable ICTs and Management Systems for Green Computing* .
ISBN 1466618396 ISBN-13 9781466618398

Rhoton, J., (2009). *Cloud Computing Explained*. Recursive Limited.
ISBN 0956355609 ISBN-13 9780956355607

Hurwitz, S., Bloor, R., Kaufman, M., Halper, F., (2009). *Cloud Computing For Dummies*. John Wiley & Sons.
ISBN 9780470484708 ISBN-13 0470484705

Jordan, T., *Partly Cloudy Getting started with Cloud Computing*. 2011 Editionth Edition. Amazon.

Baroudi, C., Hill, J., Reinhold, A., Senxian, J., (2009). *Green IT For Dummies*. For Dummies.
ISBN 0470386886 ISBN-13 9780470386880

Barr, J., *Host your website in the cloud: Amazon Web Services Made Easy*. 2010 Editionth Edition. Sitepoint.

Other Resources

IEEE Database

ACM Database

https://www.owasp.org/index.php/Main_Page

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

MGMT08085 2023
Lean and Operational Excellence

Mandatory Delivered in Stage 2 Semester 3

Full Title	Lean and Operational Excellence		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	David Mulligan		
Co Authors	Carine Gachon		

Module Description

During this course, we will study the application of Lean and Operational Excellence (OpEx) principles, including the Shingo model for operational excellence.

Lean is widely considered to originate from the world-class manufacturing techniques of the Japanese auto industry and in particular the Toyota Production System (TPS). Lean and OpEx been embraced by leading global companies in the manufacturing and service sectors and are now the foremost process improvement approach for organisations that wish to attain world-class performance in quality and customer satisfaction by eliminating 'waste' in their processes. In Lean terms ‘waste’ refers to anything that does not add value to the product or service in the eyes of the customer.

The Lean tools are a key component and enabler of Operational Excellence where problem-solving, teamwork and leadership results in continuous improvement in the workplace. Although originating in manufacturing, the Lean tools and techniques are also being used in healthcare, banking and government sectors where benefits have been achieved in productivity, efficiency, and cost reduction.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe the key principles of Lean and Operational Excellence (OpEx) and how they can be used to drive continuous improvement and competitive advantage in an organisation. e.g. Lean transformation, Strategy deployment.
2.	Recognise the potential sources of waste in a process and identify the appropriate Lean tool(s) to measure and reduce/eliminate that waste. e.g. Leader Standard Work (LSW), Audits, Gemba waste elimination walks.
3.	Demonstrate the application of typical Lean tools such as Value Stream Mapping, SMED, Error Proofing, 5S, Visual Management, TPM, Kaizen Events, in creating a continuous flow.
4.	Identify and use the appropriate metrics and Key Performance Indicators (KPIs) to improve process performance in terms of quality, throughput, productivity and cost. e.g. Yield, Lead time, Cycle time, Downtime and Efficiency
5.	Demonstrate the use of problem-solving tools such as 5-Whys, Brainstorming, Cause & Effect (Fishbone) and A3 sheets in Root Cause Analysis (RCA).

Indicative Syllabus

Topics covered will include the following:

Principles of Lean and Operational Excellence

- Introduction to Lean & Operational Excellence
- Strategy Deployment - the five strategies to becoming lean.
- Lean transformation and the culture of continuous improvement.
- Identify Waste in your process – The 7 Deadly Wastes
- Toyota Productions System (TPS)
- The Shingo prize

Standard Work

- Workplace Standardisation
- Leader Standard Work
- Gemba walks

Problem Solving

To include linking of the problem solving to other lean tools. e.g. 5S for a safety or movement waste issue, SMED for a reduction in changeover time, poke yoke for error proofing and eliminating the mistake.

- Plan Do Check Act (PDCA)
- Cause & Effect Analysis
- The 5 Whys
- Brainstorming
- DMAIC approach to project management and problem-solving

- Kaizen

Lean Metrics and Key Performance Indicators (KPIs)

- Daily KPI meeting
- Productivity / Efficiency metrics
- Cycle Time / Lead Time
- Quality metrics
- Takt Time
- OEE

Value Stream Mapping

- Value Stream Mapping™ (current and future state)
- Marterial and Information flows
- Inventory and WIP

5S and Visual Management

- The 5S steps
- The Visual workplace
- Visual Management
- Visual Controls

Total Productive Maintenance (TPM)

- TPM Principles, Goals & Methods
- Elimination of equipment related waste
- Overall Equipment Efficiency (OEE) measurement
- Autonomous Maintenance

Set up Reduction (SMED)

- SMED (Quick Changeover Techniques)
- Apply the five-step changeover improvement process to achieve set-up reduction

Poka-Yoke (Error Proofing)

- Error Proofing examples
- Designing and implementing Poka-Yoke systems

Theory of Constraints (TOC)

- Push Vs Pull
- Kanban
- JIT Production Levelling / Continuous Flow

Teaching and Learning Strategy

The online teaching and learning strategy will follow the guidelines as developed by Quality Matters: http://www.qmprogram.org/
Unique to the Quality Matters Rubric is the concept of alignment. This occurs when critical course components - Learning Objectives (2), Assessment and Measurement (3), Instructional Materials (4), Learner Interaction and Engagement (5), and Course Technology (6) - work together to ensure students achieve desired learning outcomes.

Assessment Strategy

Assessment will be through a series of continuous assessments throughout the semester. These will include quizzes and assignment submissions via the IT Sligo online learning management system Moodle.

Blogs and online discussion Forums will also be used to encourage online discussion, sharing best practice and educating others (e.g fellow work colleagues) on a particular topic. Photos such as examples of Poke-Yoke (mistake-proofing) or visual management in the workplace can be incorporated into Blogs.

Repeat Assessment Strategies

Resubmission of failing elements of the assessments.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Moodle Online and Offline Assignments, Blogs and Quiz submissions	100 %	OnGoing	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Lecture	Online	2.5	Weekly

Required Reading Book List

Wilson, L., (2015). *How To Implement Lean Manufacturing, Second Edition* . McGraw-Hill Education.
ISBN 0071835733 ISBN-13 9780071835732

Rother, M., Shook, J., (2003). *Learning to See*. Lean Enterprise Institute.
ISBN 9780966784305 ISBN-13 0966784308

Programme Membership

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Atlantic Technological University

ELEC06005 2022
Manufacturing Automation (Apprenticeship)

Elective Delivered in Stage 2 Semester 3

Full Title	Manufacturing Automation (Apprenticeship)		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	06	**ECTS Credits**	10
Delivery Mode	Semester 1	**Duration**	15 weeks - (15 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Paul ODowd		
Co Authors	Carine Gachon, Alan Hannon		

Module Description

This module introduces pneumatic and electro-pneumatic technologies used to control machines.

The student will study valves, actuators and all aspects of air production, conditioning and distribution. Electro-pneumatic circuits will be designed, including multi-actuator sequences. The student will specify and size components based on system requirements.

The student will analyse basic pneumatic/hydraulic manufacturing applications and develop automated solutions using Programmable Logic Control (PLC) technology. PLC ladder logic programmes will be designed, developed and tested in accordance with industrial safety standards.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Outline the working principles of electro-pneumatic components
2.	Describe the components of pneumatic and hydraulics actuation.
3.	Simulate basic and multi-actuator pneumatic and electro-pneumatic circuits.
4.	Specify, size and select suitable pneumatic components for industrial applications
5.	Construct ladder logic programmes using Boolean Logic, IOs, timers, counters, sequencing
6.	Design and test PLC programs
7.	Identify and implement safety measures in the design of automated systems

Indicative Syllabus

Principles, units and properties of fluid power systems. Basic Pneumatic and Hydraulic systems: components and layout
Fluid Power Generation, Supply Distribution, Treatment and Sizing. Graphical symbols used in Pneumatics and Hydraulics
Directional control valves: types, operation, mounting and sizing. Pressure control and Process control valves : characteristics and sizing. Actuators: Cylinders and rotary

Basic Pneumatic and Hydraulic circuits and sequence control. Design and building circuits using both software simulation and pneumatic kits.

Applications of hydraulic/pneumatic control.

Structure and benefits of Programmable Logic Controllers (PLC)

Input/Output Components of PLCs

Ladder programming: Latching, sequencing, timing, counting.
Create PLC ladder logic programmes to control simple systems and multi-actuator sequences

Wiring and programming of PLCs

Supervisory Control and Data Acquisition (SCADA systems)
Industrial Safety, Risk Assessment and Safety Procedures
Troubleshooting and faultfinding techniques.

Teaching and Learning Strategy

The principles of manufacturing automation will be taught in formal lectures while the design, simulation, testing and troubleshooting will be practiced in laboratory sessions.

Assessment Strategy

Manufacturing Automation is a "Type 1" apprenticeship module. It is 100% assessed during the Academic Block.

Assessment is mainly task-oriented, and will be 100% continuous assessments:

Written CA (L.O. 1,2,4,7), to assess knowledge of manufacturing automation

Ongoing assignments (practical, simulation and written) in the Automation Lab (L.O.s 3,4,5,6)

Practical examination to assess the student's ability to design, develop and test PLC programmes (L.O.s 5,6,7)

Repeat Assessment Strategies

The repeat assessment will assess all learning outcomes.

Additional Facilities

Automation Studio Software, Computer Lab, PLCs

Indicative Coursework and Continuous Assessment:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Class Assessment	30 %	Week 8	1,2,4,7
Practical Evaluation	Mixture of simulation, written assesment and practical evaluation	30 %	OnGoing	3,4,5,6

End of Semester / Year Formal Exam:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Practical Evaluation	Practical Assessment of PLC design and programming	40 %	End of Semester	5,6,7

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Tiered Classroom	2	Weekly
Practical	Lab	Laboratory	4	Weekly

Recommended Reading Book List

Bolton, W., (2009). *Mechatronics: A Multidisciplinary Approach (4th Edition)* . Prentice Hall.
ISBN 0132407639 ISBN-13 9780132407632

Bsc, D., (2004). *Practical Industrial Safety, Risk Assessment and Shutdown Systems (IDC Technology (Paperback))* . Newnes.
ISBN 0750658045 ISBN-13 9780750658041

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

Online Resources

http://www.pearsoned.co.uk/bookshop/detail.asp?item=100000000582199

Other Resources

None

Programme Membership

GA_EMAPG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAPG_C06 202300 Higher Certificate in Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAJG_C06 202300 Higher Certificate in Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAJG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)

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Atlantic Technological University

MATH06023 2022
Engineering Mathematics 2 (Apprenticeship)

Elective Delivered in Stage 2 Semester 3

Full Title	Engineering Mathematics 2 (Apprenticeship)		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	15 weeks - (15 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Aoife OBrien		
Co Authors	Paul ODowd		

Module Description

This module will provide students with a solid foundation in statistics and probability relevant to a manufacturing engineer.

The module will develop the students' ability to analyse, solve and understand problems using relevant data in various applications in Manufacturing Engineering.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Implement suitable analytic procedures in problems involving discrete and continuous random variables and probability distributions.
2.	Perform statistical analysis by hand and with appropriate software and interpret the results.
3.	Identify, formulate and solve applied problems using relevant industry based data sets.
4.	Communicate their knowledge of statistics and probability both orally and in writing.

Indicative Syllabus

Data Collection & Presentation

Collection & presentation of data. Basic descriptive statistics. Histograms, box plots, stem & leaf plots. Calculation of summary statistics.

Probability

Classical, relative frequency and axiomatic definitions. Laws of probability, conditional probability, independent events, mutually exclusive events.

Probability Distributions

Random variables. Discrete and continuous distributions. Nature of probability density functions & cumulative density functions. Binomial, Poisson, normal, exponential distributions. Use of tables.

Introduction to Sampling

Sampling distribution of the mean and confidence intervals. Hypothesis testing.

Curve Fitting

Finite differences, Correlation, least squares regression, Lagrangian interpolation.

Control Charts

Common causes and assignable causes, control charts for the sample mean and the sample range. Tests for assignable causes.

Teaching and Learning Strategy

The teaching and learning strategy will include:

- **Direct instruction** including worked examples, provision of class notes, additional exercises to assist with procedural fluency
- **Self-directed learning** using ICT based activities
- **Learning-oriented assessment** using a mathematics journal system
- **Peer learning** involving cooperation, communication and the giving and receiving of peer feedback through the journal system

Assessment Strategy

Engineering Mathematics 2 is a "Type 1" apprenticeship module. It is 100% assessed during the Academic Block.

End of semester exam

Written assessment/Practical assignment using appropriate software

Journal System (Self-directed learning, Peer Learning, Learning-oriented assessment, Direct instruction)

Moodle quizzes (Self-directed learning, Learning-oriented assessment)

Each student must get an overall grade of 40% to achieve the associated module learning outcomes.

Repeat Assessment Strategies

Students will be given the opportunity to take a repeat examination.

Additional Facilities

N/A

Indicative Coursework and Continuous Assessment:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Journal Work, Online Quizzes, Written Assessments, Practical Assignment	40 %	OnGoing	1,2,3,4

End of Semester / Year Formal Exam:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	End of semester assessment	60 %	End of Semester	1,2,3,4

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	2	Weekly
Tutorial	Tutorial	Computer Laboratory	2	Weekly

Required Reading Book List

Montgomery, C., Runger, C., (2018). *Applied Statistics and Probability for Engineers*.
ISBN 1119400368 ISBN-13 9781119400363

Bird, J., (2021). *Bird's Engineering Mathematics*. Routledge.
ISBN 0367643782 ISBN-13 9780367643782

Walpole, E., Myers, H., Myers, L., Ye, K., (2016). *Probability and Statistics for Engineers and Scientists* .
ISBN 0134115856 ISBN-13 9780134115856

Literary Resources

Higher Engineering Mathematics, 7th Ed**.,** John Bird, ISBN**:** 978-0-415-66282-6 , Routledge 2014.

Engineering Mathematics 7th Ed., K.A. Stroud, Dexter J. Booth, ISBN-10: 1137031204, Palgrave Macmillan, 2013.

Technical Mathematics 6th Ed., Paul A. Calter, Michael A. Calter, ISBN 0-470-53492-2, Wiley, 2011

Journal Resources

Online Resources

learnonline.gmit.ie

http://www.mathtutor.ac.uk/

Other Resources

GMIT Maths Learning Centre

Programme Membership

GA_EMAPG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAPG_C06 202300 Higher Certificate in Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAJG_C06 202300 Higher Certificate in Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAJG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)

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Atlantic Technological University

ENER06005 2022
Building Information Modelling I - Fundamentals

Elective Delivered in Stage 2 Semester 3

Full Title	Building Information Modelling I - Fundamentals		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Cormac Flynn		
Co Authors	Carine Gachon, Willie Geraghty, Oliver Mulryan, Michelle McGuinness		

Module Description

This module covers the use of Building Information Modelling (BIM) authoring software to produce a building information model to a professional standard. Emphasis will be placed on the accurate construction of the model to enable accurate information to be extracted from it.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Explain the basic theoretical principles of BIM and its process.
2.	Apply BIM principles to the design, construction, and use of a building.
3.	Create detailed virtual models using BIM authoring software.
4.	Prepare mixed media such as documentation and video to communicate the design, construction, and sustainability of a building.
5.	Demonstrate the ability to work in a team on a BIM project.

Indicative Syllabus

Building Information Modelling: Introduction to Building Information Modelling, BIM concepts and terminologies, BIM benefits and evolution, BIM modelling requirements, BIM modelling methods. BIM software tools, interoperability and design integration. BIM application areas.

Revit Basics: Exploring the User Interface, Working with Revit Elements and Families, Starting a Project, Starting a Design: Creating and Modifying Levels, Creating and Modifying Grids.

Fundamentals of the Architectural Building Model: Creating a Basic Floor Plan, Adding and Modifying Walls. Working with Compound Walls, Roof Construction. Using Editing Tools, Adding and Modifying Doors, Adding and Modifying Windows.

Fundamentals of the structural building model: Creating a structural slab and floor, Adding and Modifying structural Walls, Using Editing Tools, Adding and Modifying structural columns and beams.

Loading Additional Building Components: Working with Component Families.

Viewing the Building Model: Managing Views, Controlling Object Visibility, Working with Section and Elevation Views, Creating and Modifying 3D Views.

Using Dimensions and Constraints: Working with Dimensions, Applying and Removing Constraints.

Detailing and Drafting: Creating Callout Views, Working with Text and Tags, Working with Detail Views, Working with Drafting Views.

Construction Documentation: Creating and Modifying Schedules, Creating Rooms and Room Schedules, Creating Legends and Keynotes.

Presenting the Building Model: Working with Drawing Sheets, Working with Title blocks, Managing Revisions, Creating Renderings, Using walkthroughs, Using Sun and Shadow Settings.

Detailing in Revit: Setting Up Detail Views, Creating Details, Annotating Details, Patterning.

Schedules: Creating Schedules, Creating Material Take-off Schedules, Scheduling Structural Elements.

Advanced View Setup: View Templates, Working with Dependent Views, Enhancing Views

Teaching and Learning Strategy

This module will follow a blended teaching and learning strategy. Students complete assigned pre-class activities, so they are prepared for the practical sessions. All face-to-face contact consists of learner-centred activities where students work together in groups on assignments. Post-class activities allow students to determine their progress with the outcomes.

Assessment Strategy

This module is 100% continuous assessment. Learners will complete and present a BIM project. Formative assessments not counting towards final marks feature weekly and allow the student to get feedback on their performance and identify areas for improvement.

Repeat Assessment Strategies

Students who do not pass will be able to resubmit components of the project. This module can only be repeated by Repeat and Attend

Additional Facilities

GMIT's learning management system, Moodle, contains a structured pathway to guide the learner through the module. This platform contains:

- Pre-class activities
- Post-class self-evaluation activities
- Video Tutorials
- Links to further resources

Microsoft OneNote Class Notebook is used to capture content created during classes and as a platform for student collaboration.

A dedicated Microsoft Teams site facilitates a community of learning for students and lecturers.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assignment	BIM project	100 %	OnGoing	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	BIM practical	Laboratory	3	Weekly

Recommended Reading Book List

Eastman, M., Eastman, C., Teicholz, P., Sacks, R., Liston, K., (2011). *BIM Handbook*. John Wiley & Sons.
ISBN 9780470541371 ISBN-13 0470541377

Aubin, P., McClelland, D., Schmid, M., Stanley, G., (2011). *The Aubin Academy Master Series: Revit MEP 2011* . Cengage Learning.
ISBN 1111137935 ISBN-13 9781111137939

Ascent, *Autodesk Revit 2022 MEP Fundamentals*. Edition. .
ISBN 1630574465 ISBN-13 9781630574468

Programme Membership

GA_EENAG_H08 202200 Bachelor of Engineering (Honours) in Energy Engineering
GA_EENEG_B07 202200 Bachelor of Engineering in Energy Engineering
GA_EENEG_C06 202200 Higher Certificate in Engineering in Energy Engineering (Exit)

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP06080 2023
Mathematics for Computing 1

Elective Delivered in Stage 2 Semester 3

Full Title	Mathematics for Computing 1		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The mathematical skills required for other computing modules are introduced in this module. This includes an examination of the way numbers are dealt with internally on a computer. The module will consider how different domains of data relate to each other and consider methods of visually representing such data.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Apply the equations of straight line and circle to geometric problems
2.	Complete calculations involving trigonometry
3.	Complete calculations and conversions in computer based number systems
4.	Represent relationships of data and logic using Set notation
5.	Understand basic principles of Graph Theory

Indicative Syllabus

1. Co-ordinate Geometry

- Co-ordinate systems, rectangular and polar in 2D and 3D points, distance between points, area of triangle, standard equations of straight line, slopes, angle between two lines, distance of point from a line, circle and its tangent, and simple problems involving circles and lines, curve sketching of conics and other curves, parametric equations, equation of surfaces in 3D

2. Trigonometry

- Trigonometric ratios and their graphs.
- Solution of simple triangulation problems.

3. Computer based number systems

- Perform calculations using number bases other than base 10
- Complete conversions between computer based number systems

4. Set Theory

- Specification
- Notation
- Relationships between sets
- Venn Diagrams

5. Graph Theory

- Basic Concepts of Graph Theory
- Matrix representation of a graph (Adjacency Matrices)
- Isomorphism of graphs

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of mathematical concepts and their applications in computing. Students will be exposed to real-world problems and scenarios related to computing that require the application of mathematical concepts and techniques. This approach allows students to apply theoretical knowledge to practical situations, enhancing their problem-solving and critical thinking skills.

Assessment Strategy

The module will comprise 30% Coursework and 70% Final Exam.

Coursework may comprise a mix of assessment approaches, such as: Practicals, class tests, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

Indicative Assessment

Element No	Weighting	Type	Description	Learning Outcome Assessed
1	15%	Time constrained test	A closed book written test which corresponds to the content delivered in learning outcome 1 and 2	1,2
2	15%	Online quizzes	An average mark is taken corresponding to mark achieved in quizzes related to learning outcome 1 to 5 completed throughout the semester	1,2,3,4,5
3	70%	Final examination	Closed book final examination with questions relating to learning outcomes 3 , 4 and 5	3,4,5

End of Semester Final Examination

The final written examination will be **2** hours in duration. It will comprise **3** questions of which the learner should attempt **2** questions.

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**30 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assesment	30 %	End of Semester	1,2,3,4,5

End of Semester / Year Formal Exam:		**70 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	70 %	End of Semester	1,2,3,4,5

Full Time Delivery Mode:

Type	*Description*	*Location*	*Hours*	*Frequency*
Lecture	Lecture	Lecture Theatre	1	Weekly
Tutorial	Tutorial	Flat Classroom	1	Weekly
Practical	Practical	Computer Laboratory	2	Weekly

Required Reading Book List

Grossman, P., (2008). *Discrete Mathematics for Computing*. Red Globe Press.
ISBN UCSC:32106019854154

Trudeau, J., *Introduction to Graph Theory*. Courier Corporation.
ISBN 9780486678702 ISBN-13 0486678709

Makinson, D., (2008). *Sets, Logic and Maths for Computing*. Springer Science & Business Media.
ISBN 9781846288449 ISBN-13 1846288444

Lipschutz, S., Lipson, M., (2009). *Schaum's Outline of Discrete Mathematics, Revised Third Edition* . McGraw Hill Professional.
ISBN 9780071615877 ISBN-13 0071615873

Other Resources

Wolfram Mathworld accessed at http://mathworld.wolfram.com/

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP06081 2023
Virtualization for Green IT

Elective Delivered in Stage 2 Semester 3

Full Title	Virtualization for Green IT		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

This module will provide the student with the basic building blocks surrounding virtualization for green infrastructure. The module will serve as a motivator to further investigate the complexities surrounding virtualization.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Evaluate the advantages of a contemporary virtualization environment.
2.	Select and configure virtualization operating systems and environments for specific purposes.
3.	Understand the selection of hardware platforms suited to the scale of business requirements.
4.	Implement security, management and business continuity strategies suited to a virtualized infrastructure.
5.	Examine the provision of resources as services.

Indicative Syllabus

1. Creating a Virtual Environment

- Models for virtualization
- Designing the enterprise virtual environment
- Application virtualization
- Selection of platforms, networks and systems and the selection of guest OS
- Local, outsourced and cloud virtualization

2. Virtual Host Administration

- Host environment infrastructure and planning for local hosting
- Planning for outsourcing and cloud, the economics of the data centre
- Provisioning
- Green technologies for service hosting
- Enterprise storage and storage oriented connectivity
- Models for secure networking, NG Firewalls and Virtual Firewalls

3. Management of the Virtual Environment

- Server consolidation
- Enterprise scale management tools for virtualized environments
- Integrating with the infrastructure, power, cooling, lighting
- Reliability, redundancy, failover, load-balancing, backup and recovery, DR
- Case Studies

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of virtualisation technologies and their applications in Green IT. Students will work on real-world projects throughout the course, gaining hands-on experience in designing, implementing, and managing virtualised environments for sustainable IT practices. This practical experience will help students develop their virtualisation skills and apply the theoretical concepts that have been learned in the course to real-life situations.

Assessment Strategy

The module will comprise 50% Coursework and 50% Final Exam.

Coursework may comprise a mix of assessment approaches, such as: case studies, reports, practicals, presentations, portfolios, class tests, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

End of Semester Final Examination The final written examination will be 2 hours in duration. It will comprise 5 questions of which the learner should attempt 4 questions.

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	50 %	End of Semester	2,4

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	50 %	End of Semester	1,3,5

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecturers	Not Specified	1	Weekly
Tutorial	Tutorials	Not Specified	1	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learning	Not Specified	3	Weekly

Required Reading Book List

Kusnetzky, D., (2011). *Virtualization*. "O'Reilly Media, Inc.".
ISBN 9781449306458 ISBN-13 1449306454

Schulz, G., (2009). *The Green and Virtual Data Center*. Auerbach Publications.
ISBN 1420086669 ISBN-13 9781420086669

Stallings, W., Brown, L., (2012). *Computer Security*. Prentice Hall.
ISBN 0132775069 ISBN-13 9780132775069

Sosinsky, B., (2011). *Cloud Computing Bible*. John Wiley & Sons.
ISBN 9780470903568 ISBN-13 0470903562

Tanenbaum, S., (2008). *Modern Operating Systems*. Prentice Hall.
ISBN 0136006639 ISBN-13 9780136006633

Sobell, G., (2010). *A Practical Guide to Linux Commands, Editors, and Shell Programming* . Prentice-Hall PTR.
ISBN UCSD:31822037482593

Sterling, D., Kumar, P., (2011). *Dancing on a Cloud*. Xlibris Corporation.
ISBN 1465393668 ISBN-13 9781465393661

Spafford, G., (2008). *The Governance of Green IT*. IT Governance Ltd.
ISBN 1905356749 ISBN-13 9781905356744

Other Resources

Cloud-Standards.org

IEEE Database

ACM Database

CISCO Materials

Extensive use will be made of original support material from the chosen Operating System(s) for this course.

Webography:

www.linux.com www.ubuntu.com www.centos.org www.microsoft.com www.virtualbox.com

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP06082 2023
Computer Architecture and Operating Systems 1

Elective Delivered in Stage 2 Semester 3

Full Title	Computer Architecture and Operating Systems 1		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon		

Module Description

To introduce the learner to the fundamentals of computer architecture as it provides a platform for an operating system and the execution of programs.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Identify and describe the basic components of a computer system and their relationship to each other.
2.	Locate and detail the roles of the CPU and main memory in the context of the overall system and the execution of a program.
3.	Describe and explain the different types of memory (cache, registers, main memory).
4.	Perform basic command line and system administration tasks on a newly installed operating system.
5.	Describe the functions of an operating system as it relates to the architecture of the computer.

Indicative Syllabus

Digital Logic & Data Representation

- Basic Electrical Principles
- Digital Logic (logic gates etc)
- Representation of numeric data and text.
- Arithmetic of computer systems in theory and in hardware.

The CPU and Main Memory

- The Stored Program Von Neumann Architecture
- The CPU: the ALU, the registers, the control unit, the data path.
- Memory Hierarchy: memory cells, memory addresses and addressing, read and write operations.
- Cache memory

The Execution of a Program

- Program compilation.
- The Fetch-Decode-Cycle.

The Role of the Operating System

- Layers of a Computer System
- Components of an Operating System
- Program Life Cycle

Assembly Language and Machine Code

- Principles of assembly language programming
- Simple assembly programs.

Secondary Storage

- Basic properties of secondary storage devices.
- Implementation of HDDS vs. SSDs.
- File-systems – properties and commands.

Teaching and Learning Strategy

Lecturers will use an active learning approach that encourages students to actively engage in the learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of computer architecture and operating systems concepts. Students will be exposed to real-world problems and scenarios related to computer architecture and operating systems. This approach allows students to apply theoretical knowledge to practical

situations, enhancing their problem-solving and critical thinking skills.

Assessment Strategy

This module will be assessed by 50% coursework and 50% exam. Coursework may comprise a mix of assessment approaches, such as: reports, practicals, presentations, class tests and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Windows 10 Basic File-System and Infrastructure GUI and command line	15 %	OnGoing	4
Assessment	Windows 10 Installation and System Administration on a VM	15 %	OnGoing	4
Assessment	Computer Hardware Practicals	20 %	OnGoing	1,2

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Examination	50 %	End of Semester	1,2,3,5

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecturers	Lecture Theatre	1	Weekly
Tutorial	Tutorials	Not Specified	1	Weekly
Practical	Lab Practicals	Computer Laboratory	2	Weekly
Independent Learning	Independent Learning	Not Specified	4	Weekly

Recommended Reading Book List

Stallings, W., Zeno, P., (2016). *Computer Organization and Architecture*.
ISBN 1292096853 ISBN-13 9781292096858

Nisan, N., Schocken, S., (2021). *The Elements of Computing Systems, second edition*. MIT Press.
ISBN 9780262539807 ISBN-13 0262539802

Silberschatz, A., Galvin, B., Gagne, G., (2018). *Operating System Concepts*.
ISBN 1119456339 ISBN-13 9781119456339

Arpaci-Dusseau, H., Arpaci-Dusseau, C., (2018). *Operating Systems*. Createspace Independent Publishing Platform.
ISBN 198508659X ISBN-13 9781985086593

Petzold, C., (2000). *Code*.
ISBN UOM:39015056941902

Online Resources

https://www.tomshardware.com

https://linustechtips.com

Linus Tech Tips YouTube Channel

Other Resources

IEEE Database

ACM Database

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP06084 2023
Introduction to Data Science

Elective Delivered in Stage 2 Semester 3

Full Title	Introduction to Data Science		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon		

Module Description

This module will introduce the students to the lifecycle of a Data Science project from data capturing to data visualizations. It will investigate the benefits of data within an organization and show how data can aid managers in reaching their business objectives. The student will explore the tools and techniques available to capture and analyze data to allow them to create a data science solution to meet a set of business requirements.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe the importance of data to an organisation.
2.	List and describe the different methods of collecting data within an organisation.
3.	Examine and choose appropriate data cleaning techniques for a given set of requirements.
4.	Demonstrate their knowledge of data processing through a series of data analysis tasks using an appropriate tool.
5.	Outline and apply appropriate methods to communicate their results to business managers.

Indicative Syllabus

1. Introduction to Data

- The role and importance of data within organisations
- How data is recorded within organisations
- Different types of data
- Identify patterns in data and show how data supports data science projects to solve real world problems
- Data and Artificial Intelligence

2. Data Requirements

- Techniques used to understand business problems and requirements e.g. meetings, interviews, presentations, questionnaires.
- Data Requirements of a project
- Data Capturing
- Data Storage
- Data Extraction i.e. cleaning data e.g. removing outliers

3. Data Processing

- Type of Data Statistics i.e. Descriptive and Predictive
- Data Statistics Tools e.g. R, Excel, Tableau
- Data Exploration
- Data Analysis
- Data Mining
- Data Results & Evaluation

4. Data Results

- Data Labelling
- Reporting
- Visualisations

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote deeper understanding of data science concepts.

Students will be engaged in project-based learning, working on real-world data sets throughout the course. This hands-on experience will help students to develop their

data analysis skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

This module will be assessed via 100% coursework, which may include quizzes, class tests and written assessments.

Repeat Assessment Strategies

Repeat coursework.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Given a business problem prepare a data set for exploration and analysis.	30 %	OnGoing	1,2,3
Assessment	Perform various data analysis tasks	40 %	OnGoing	4
Assessment	Communicate the results of the analysis to end users.	30 %	OnGoing	5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lectures	Lecture Theatre	1	Weekly
Tutorial	Tutorials	Not Specified	1	Weekly
Practical	Practical	Computer Laboratory	2	Weekly
Independent Learning	Independent Learning	Not Specified	4	Weekly

Required Reading Book List

Skiena, S., (2017). *The Data Science Design Manual*. Springer.
ISBN 3319554433 ISBN-13 9783319554433

Cielen, D., Meysman, A., Ali, M., (2016). *Introducing Data Science*. Manning Publications.
ISBN 1633430030 ISBN-13 9781633430037

Kelleher, D., Tierney, B., (2018). *Data Science*. MIT Press.
ISBN 9780262535434 ISBN-13 0262535432

Pierson, L., (2017). *Data Science For Dummies*. John Wiley & Sons.
ISBN 9781119327639 ISBN-13 1119327636

Gardener, M., (2017). *Statistics for Ecologists Using R and Excel*. Data in the Wild.
ISBN 178427139X ISBN-13 9781784271398

Other Resources

IEEE Database

ACM Database

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

MECH06035 2023
Sustainable Design 1

Mandatory Delivered in Stage 2 Semester 4

Full Title	Sustainable Design 1		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module addresses the issues associated with the innovative design of products/ that takes into account the sustainable development goals. The students learn to take into consideration multiple factors into their design. In this module they concentrate on the design of the product.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Participate in the design and redesign of engineering components and products that satisfy sustainable design principles.
2.	Employ modelling software to create models and prototypes of product ideas.
3.	Employ appropriate software tools to design products that satisfy sustainable design principles.
4.	Employ product performance analysis techniques including safety and other standards and regulations.

Indicative Syllabus

SUSTAINABLE DESIGN PRINCIPLES

INNOVATION: Innovation as a team-based activity. Innovation techniques.

PROTOTYPING AND MODELLING: The Engineering Design Process. Creating prototypes using parametric modelling software.

DESIGN FOR EXCELLENCE: DFX

DESIGN AND MATERIALS: Product Function and Material Properties.

MATERIALS SELECTION: Selection of Materials Using Software.

DESIGN COSTS: Types of costs. Financial Analysis Techniques. Pricing. Economics of design. Product Lifecycles. Lifecycle strategies. Product Portfolios.

PRODUCT PERFORMANCE: Taguchi. FMEA. Reliability. Maintainability. Failure. Safety. Performance Standards including Legal Standards.

Teaching and Learning Strategy

The Teaching and Learning strategy involves workshop /lab sessions involving group work on product design applications and the use of software (i.e. parametric modelling, material selection, etc..) .

Students engage in group project supported by the weekly workshops.UDL principles guides the project which is concerned with the redesign of a manufactured product taking into account sustainable design principles.

Assessment Strategy

The outcomes of each lab session are assessed, and these results are provided to the student on an ongoing basis. .

The module project is a group based project. This project is submitted at the end of the module delivery and the marks are included in the overall module mark.

Repeat Assessment Strategies

Students who are deemed to have failed this module will be dealt with in one of the following ways;

- if a student has failed the module he/she will be assigned appropriate assignments to be completed over the summer period.
- if the student fails the repeat assignment he/she will be required to repeat attend for the module.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Group Project	Re-Design of manufactured product	40 %	OnGoing	1

Assessment	Cad Labs	20 %	OnGoing	2
Open Book Exam	Class Tutorials	20 %	OnGoing	4
Assessment	Materials Selection Labs	20 %	OnGoing	3

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	LAB SESSION	Computer Laboratory	3	Weekly

Required Reading Book List

Trott, P., *Innovation Management and New Product Development* . Edition. Prentice Hall.
ISBN 0273736566 ISBN-13 9780273736561

Irmeli, H., *The Handbook of Market Intelligence*. Edition. John Wiley & Sons.
ISBN 9781118923627 ISBN-13 1118923626

Recommended Reading Book List

Ulrich, K., (2003). *Product Design and Development*. McGraw-Hill/Irwin.
ISBN 0072471468 ISBN-13 9780072471465

Ashby, F., *Materials Selection in Mechanical Design ISBN 9380931727 ISBN-13 978-9380931722*. Edition. Butterworth-Heinemann.

Online Resources

WWW.GMIT.IE/LEARNONLINE

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ENGI06070 2023
Regulatory Affairs

Mandatory Delivered in Stage 2 Semester 4

Full Title	Regulatory Affairs		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module will give in an introduction to the concept of Quality. It will deal with the Quality Assurance systems and quality management principles needed in manufacturing and service organisations.

The module will deal with the tools and techniques used to measure, analyse and control quality on a manufacturing line.

The module will explore the relationship between quality systems and the sustainable development goals.

This course will provide students with an introduction to the regulations and regulatory agencies that are specific to the medical devices industry.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	List and explain the main standards and regulations ruling the manufacturing industry,
2.	Describe the functions of different authorities, agencies, departments, agencies and other bodies responsible for developing and implementing the laws and associated regulations ruling the manufacturing industry.
3.	Analyse and apply a range of statistical tools to measure quality. Select appropriate methodologies of quality improvement and apply various tools and techniques for analysis of quality.
4.	Describe how quality systems contribute the sustainable development goals.

Indicative Syllabus

Introduction to Regulatory Affairs:

- CE marking
- ISO standards (ISO 5000, 9000 and 14000)
- EPA role and licensing for Industry
- GMP, EMA and FDA role and regulations
- Monitoring and reporting

Introduction to Quality

- Satisfying customers' needs, adhering to specifications.
- Quality Management Philosophies and gurus Deming, Juran, Crosby, Ishikawa and Feigenbaum
- Total Quality Management – setting up an organisational structure and environment to deliver quality
- Cost of Quality
- Continuous Improvement and PDCA
- Quality tools
- Quality and the sustainable development goals.

Teaching and Learning Strategy

The teaching and learning strategy includes direct instruction, and flip classroom where students study the theory in advance of attending the class where discussions and case studies are used to reinforce the theory. In the practical part of the module, students experiment with quality tools.

Assessment Strategy

Online quizzes

Case studies

Computer based exercises

Closed book examination

Repeat Assessment Strategies
Students will be given the opportunity to take a repeat examination.

Additional Facilities
Computer Lab

Indicative Coursework and Continuous Assessment:		50 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Multiple Choice/Short Answer Test	Online quizzes	10 %	OnGoing	1,2,3,4
Assessment	Quality tools exercises	20 %	OnGoing	3
Assignment	Case studies	20 %	End of Semester	1,2,3,4

End of Semester / Year Formal Exam:		50 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Assessment	50 %	End of Semester	1,2,3,4

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Asynchronous learning	Online	1	Weekly
Online Learning	Practical	Online	2	Weekly

Recommended Reading Book List
Besterfield, H., (2008). *Quality Control (8th Edition)*. Pearson. ISBN 0135000955 ISBN-13 9780135000953
Montgomery, C., (2009). *Statistical Quality Control, 7th Edition*. Wiley.
Griffith, K., (2012). *Quality Technician's Handbook, The*. Pearson.
Theisz, V., (2015). *Medical Device Regulatory Practices: An International Perspective* . Pan Stanford.

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

CIVE06112 2023
Water and Wastewater Science

Elective Delivered in Stage 2 Semester 4

Full Title	Water and Wastewater Science		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	David Mulligan		
Co Authors	Carine Gachon		

Module Description

This module deals with selected aspects of Water and Wastewater Science that are relevant to Water and Wastewater Treatment Plants. This module will introduce the importance of water, it sources, its uses, the quality of water, the sources and types of water pollution, how it is measured and how these measurements are interpreted. It forms the foundation module for all Modules in 2nd, 3rd and 4th semester modules.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Name, explain and apply the various basic concepts of Water and Wastewater .
2.	Distinguish sources, uses and quality of Water and Wastewater.
3.	Identify sources and types of pollution.
4.	Interpret scientific measurements and results.

Indicative Syllabus

- The Hydrological Cycle:
- Sources and Uses of Water in Ireland:
- The Quality of Water:
- Sources and Types of Pollution:
- Measurement of Water Quality and Pollution:
- Wastewater Composition
- Interpretation of Units and Measurements:

Teaching and Learning Strategy

This module will be delivered using blended learning techniques. This will include online lectures (via adobe connect or similar), workshops augmented by independent learning and directed learning and assessment. This approach is expected to address student-learning needs. A learning platform such as Moodle will be used to upload educational material (i.e. presentations and recordings of online lectures plus supplementary reading material) and as a means of assessment (e.g. quizzes, uploading assignments and journals). This blended approach (lectures and workshops) brings students together to facilitate group learning

Assessment Strategy

This module is 100% Continous Assessment:

Flow Diagram of Plant and Oral Presentation: 40%

MCQ: 30%

Presentation: 30%

Repeat Assessment Strategies

Repeat Continuous Assessment

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Individual Project	Flow Diagram Oral Presentation	40 %	Week 5	1,3

Multiple Choice/Short Answer Test	MCQ	30 %	OnGoing	2,4
Group Project	Presentation	30 %	End of Semester	1,3

Full Time Delivery Mode:

Type	*Description*	*Location*	*Hours*	*Frequency*
Online Learning	Lecture	Online	1	Weekly
Seminar	Workshop	Computer Laboratory	2	Twice Per Semester
Online Learning	Asynchronous Learning	Not Specified	1	Weekly

Required Reading Book List

Butterworth-Heinemann, A., *2005-05-24 Water Technology: An Introduction for Environmental Scientists and Engineers Title ISBN 0750666331 ISBN-13 9780750666336*. 1st Edition. A Butterworth-Heinemann.

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ENGI06068 2022
Thermodynamics

Elective Delivered in Stage 2 Semester 4

Full Title	Thermodynamics		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Tom Roche		
Co Authors	Carine Gachon, Oliver Mulryan		

Module Description

An introduction to the principles of thermodynamics

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe in detail the state of a thermodynamic system as well as the properties and characteristics of thermodynamic processes (Isobaric, Isochoric, Isothermal, Polytropic, Adibatic)
2.	State the Zeroth and First Law of thermodynamics and demonstrate its application to both closed and open thermodynamic systems by been able to solve thermodynamic problems involving an ideal gas, phase change fluids, and incompressible substances by using the steady flow energy equation
3.	Calculate using steady flow energy equation, enthalpy temperature diagrams and steam tables the work and power generated in a steam power plant
4.	Apply the First and Second Laws of Thermodynamics to work processes in thermodynamics components and to all cycles for energy efficient and sustainable power production, for the listed thermodynamic systems: o Carnot Heat Engine and Heat Pump o Stirling Heat Engine o Otto Heat Engine o Diesel Heat Engine o Simple Brayton Heat Engine
5.	Analyse and Evaluate the actual and ideal vapour compression refrigeration cycle and hense analyse the operation of heat pumps and refrigeration systems, with a view to increasing energy efficiency, and the delivery of sustainable energy solutions to support the SDGs 12 and 13.

Indicative Syllabus

LECTURES

Course Overview and assessment criteria

Introduction to Sustainable Development Goals (SDG) and the relevance of Thermodynamics to achieving these goals.

Review of Heat and Gas Laws

- Temperature Scales, Specific Heat Capacity, Boyles, Charles Law, Ideal Gas Law and Introduce Dalton's Law of Gas Mixtures, and fluid mixing (Compressibile and Incompressible)

Introduction to Thermodynamics:

- Basic Definitions (Thermodynamic System, Open/Closed System, Properties, Process, Cycle, Intensive/Extensive Formats, Phases)

Vapour Phases and Properties:

- Supercooled, Liquid-Vapour and Superheated phases, PV, TV Diagrams and Steam tables (Quality, Specific Volume, Specific Enthalpy, Specific Entropy)

Zeroth and First Law

- Non Flow and Steady Flow Energy Equations. Reversible Non Flow Processes (Isochoric, Isobaric, Isothermal, Polytropic, Isentropic). Irreversible processes (Constant Enthalpy/Throttling and Adiabatic Mixing). Applications: Compressible Nozzle Flow, Total Temperature, Pressure Relations

Second Law (Heat Engines and Heat Pumps)

- Reversibility & Irreversibility, Relationship between Work & Heat Energy. Concept of Thermal Efficiency, COP, Clausius and Plank Statements.
- Applications: Ideal Heat Engine and Pump (Carnot), Carnot's Theorems and the Striling Heat Engine
- Air Breathing Heat Engines (i.e. Otto, Diesel and Brayton Cycle).

Applications of theory to steam energy transfer systems, turbine systems, heat engines, refrigeration and heat pumps.

Teaching and Learning Strategy

The module will be broken into tutorials and lectures. The Tutorials will be used to solve problems given to students as part of the program. Some demonstrations are carried out in class on the use of boilers, bomb calorimeter and in heating systems.

Students will carry out a energy generation, storage and distribution system laboratory at the beginning of the module to gain an under standing of heat energy flow. The student will use the Lab on Line in class to carry out calculations and view the process in action.

The students will carry out a refrigeration experiment using the lab equipment.

Assessment Strategy

Assessment will consist of:

Final Exam

Class based desk Assessments

Laboratory Submissions.

Students have to work in teams over the duration of the semester to solve problems allocated at the start of term. At the end of term students will be asked to present the solution to a random question from the set assigned) on the board and will be graded accordingly.

Repeat Assessment Strategies

Repeat assessments is not possible however students can repeat the final exam.

Additional Facilities

NA

Indicative Coursework and Continuous Assessment:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Laboratory Experimentation	20 %	OnGoing	4,5
Assessment	Class Assessment	20 %	Week 8	2,3,4,5

End of Semester / Year Formal Exam:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
UNKNOWN	Final Exam	60 %	End of Term	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	lecture	Tiered Classroom	3	Weekly
Tutorial	Tutorial	Flat Classroom	2	Weekly

Required Reading Book List

Boles, M., Cengel, Y., (2014). *Thermodynamics: An Engineering Approach*. McGraw-Hill Education.
ISBN 0073398179 ISBN-13 9780073398174

Literary Resources

Thermodynamics an Engineering Approach
By Cencel Boles
ISBN: 0-07-112177-3

Engineering Thermodynamics, Work and Heat Transfer
By Rogers and Mayhew: Prentice Hall.
ISBN: 0-582-04566-5

Heat Transfer
By J.P Holman
ISBN: 0071122303

Online Resources

None

Other Resources

None

Programme Membership
GA_EENAG_H08 202200 Bachelor of Engineering (Honours) in Energy Engineering
GA_EENEG_B07 202200 Bachelor of Engineering in Energy Engineering
GA_EENEG_C06 202200 Higher Certificate in Engineering in Energy Engineering (Exit)
GA_EAGRG_C06 202200 Higher Certificate in Engineering in Agricultural Engineering (Exit)
GA_EMECG_C06 202200 Higher Certificate in Engineering in Mechanical Engineering (Exit)
GA_EMECG_B07 202200 Bachelor of Engineering in Mechanical Engineering
GA_EMEAG_H08 202200 Bachelor of Engineering (Honours) in Mechanical Engineering
GA_EAGRG_H08 202300 Bachelor of Engineering (Honours) in Agricultural Engineering
GA_EAGRG_B07 202300 Bachelor of Engineering in Agricultural Engineering

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Atlantic Technological University

MECH06031 2022
Building Information Modelling II - Building Services

Elective Delivered in Stage 2 Semester 4

Full Title	Building Information Modelling II - Building Services		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Willie Geraghty		
Co Authors	Carine Gachon, Oliver Mulryan, Cormac Flynn, Michelle McGuinness		

Module Description

The purpose of this module is to introduce the participants to Building Information Modelling (BIM) as it applies to Mechanical, Electrical, Heating, Ventilation and Plumbing of buildings.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Have detailed knowledge and understanding on MEP BIM models
2.	Have a good understanding of the design criteria required for MEP models
3.	Design and Build MEP models for basic installations
4.	Prepare and produce information and data from MEP BIM Models

Indicative Syllabus

REVIT (MEP)
Conceptual Underpinnings of Revit MEP: MEP Building Information modelling, Revit MEP Key Concepts, Exploring an Existing Project.
Fundamentals of MEP Project Setup: Preparing the Architectural Model, Purging the Architectural Model, Creating a New Project, Linked Project Settings, Copying Title blocks, Load a Title block Family and Create Sheets, Wrapping Up a Project Setup.
Energy Analysis: Understanding the Workflow, Managing the "I" in BIM, the Importance of Project Collaboration, Space Elements, Zones, Energy Analysis.
Mechanical Systems: Mechanical Settings, Creating a Ceiling Plan View for Coordination, Placing Air Terminal Devices, Placing Mechanical Equipment, Ductwork, Additional Ductwork Tools.

Piping Systems: Plumbing and Pipe Settings, Boiler Room Piping - Semi-Automatic Approach, Boiler Room Piping - Manual Approach.

Electrical Systems: Placing Electrical Equipment, Circuiting Equipment, Checking Connections in System Browser, Create the Main Service Entrance, Copy Equipment to a Level, Create Lighting Views, Modifying Light Fixture Types, Lighting Switches, Switch Systems, Electrical Fixtures, Circuit the Receptacles, Wire Tags, Define a Special Purpose Receptacle, Distribution Systems, Conduit, Circuiting Mechanical Equipment, Other Device Types, Cable Tray, Lighting Fixture Annotations, Panel Schedules, Modify a Panel Schedule Template, Create an Electrical Equipment Schedule, Electrical Distribution Basics, Load Classifications and Demand Factors, Electrical Settings.

Detailing and Annotation: Detailing in Revit, Annotation, Drafted Details, Working with Legacy Details, Additional Detailing Techniques.

Working with Schedules and Tags: Create and Modify Schedule Views, Editing the Model, Working with Tags, Room and Room Tags, Querying Data, Add a Color Scheme, Working with Area Plans.

Ceiling Plans and Interior Elevations: Creating Ceiling Elements, Creating Interior Elevations.

Printing, Publishing, and Exporting: Print Setup Printing, Printer Driver Configuration, Troubleshooting Printing, Export to CAD, Export a DWF File, Publishing Tools

Setting Up MEP Project Levels and Views: Working with Levels, Rough Out the Building Form, Working with Elevation Views, Creating Section Views, Schedule Views, Sheet Views, Drafting Views.

Working with MEP Families: Kinds of Families, Family Libraries, Family Strategies, Accessing Families in a Project, Accessing Libraries, Edit and Create Family Types, Customizing Families, Building Custom Families, Building Parametric Families.

Various plug-ins for Revit MEP

Teaching and Learning Strategy

This module will follow a blended teaching and learning strategy. Students complete assigned pre-class activities, so they are prepared for the practical sessions. All face-to-face contact consists of learner-centred activities where students work together in groups on assignments. Post-class activities allow students to determine their progress with the outcomes.

Assessment Strategy

This module is 100% continuous assessment. Learners will complete and present a BIM project. Formative assessments not counting towards final marks feature weekly and allow the student to get feedback on their performance and identify areas for improvement

Repeat Assessment Strategies

Students who do not pass will be able to resubmit components of the project. This module can only be repeated by Repeat and Attend

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Individual Project	MEP Project	100 %	End of Semester	1,2,3,4

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	1	Weekly
Practical	Practical	Laboratory	3	Weekly

Required Reading Book List

Ascent, *Autodesk Revit 2016 MEP Fundamentals*. Edition. .
ISBN 1585039705 ISBN-13 9781585039708

Recommended Reading Book List

Whitbread, S., (2015). *Mastering Autodesk Revit MEP 2016*. John Wiley & Sons.
ISBN 9781119059387 ISBN-13 1119059380

Programme Membership

GA_EENAG_H08 202200 Bachelor of Engineering (Honours) in Energy Engineering
GA_EENEG_B07 202200 Bachelor of Engineering in Energy Engineering
GA_EENEG_C06 202200 Higher Certificate in Engineering in Energy Engineering (Exit)

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Atlantic Technological University

COMP06083 2023
Database Systems

Elective Delivered in Stage 2 Semester 4

Full Title	Database Systems		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		

Module Description

This module will allow the learner to examine the different database architectures and their environment and will teach them how to design and implement a relational database. In addition, the learner will manipulate and design a database using database languages.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Give an appraisal of the database environment.
2.	Evaluate the database models and their integrity rules
3.	Design and implement a relational database
4.	Apply the technique of normalisation
5.	Write SQL commands for data manipulation and data definition of a relational schema.

Indicative Syllabus

1. Database Approaches

- Role and advantages.
- Architecture.
- The DBMS environment.

2. Database Models

- Terminology.
- Evaluation of Database Models
- Use Case
- Database Integrity.
- ACID/CAP Theorem

3. Database Design

- Purpose and notation of an entity relationship diagram (ERD).
- Drawing ERDs.
- Mapping to a relational database.

4. Normalisation

- The purpose of normalisation.
- Functional dependencies
- Applying the process of normalisation.

5. SQL

- Structure of an SQL statement.
- Definition, creation, altering and deletion of tables and data.
- Retrieval of data using select statement from singular and multiple tables
- Use of comparison operators, aggregate functions, sorts, groups and pattern matching

Teaching and Learning Strategy

Lecturers will use an active learning approach that encourages students to actively engage in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote deeper understanding of database concepts and techniques. Students will work on real-world projects throughout the course, gaining hands-on experience in designing, implementing, and managing databases. This practical experience will help students develop their database management skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

This module will be 100% coursework.

Coursework may comprise a mix of assessment approaches, such as: reports, practicals, class tests, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

Repeat Assessment Strategies

Repeat coursework.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Student to develop an ERD based on system description given. Identify all required keys and map the ERD to a set of relational/non-relational database tables.	25 %	OnGoing	1,2,3
Assessment	Given a set of unnormalised data the student will identify dependencies, assess problematic table design, and transform to generate a set of normalised relational tables.	25 %	OnGoing	3,4
Assessment	Student will take a set of Normalised relational tables and create a database architecture and populate with data. They will write SQL queries to return data as requested from single and multiple tables.	50 %	OnGoing	1,2,3,4,5

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecures	Lecture Theatre	2	Weekly
Practical	Practical	Computer Laboratory	2	Weekly
Independent Learning	Independent Learning	Not Specified	4	Weekly

Recommended Reading Book List

Connolly, M., Begg, E., (2014). *Database Systems*.
ISBN 1292061189 ISBN-13 9781292061184

Kroenke, M., Auer, J., Yoder, C., Vandenberg, L., (2018). *Database Processing*.
ISBN 0134802748 ISBN-13 9780134802749

Meier, A., Kaufmann, M., (2019). *SQL & NoSQL Databases*. Springer Vieweg.
ISBN 3658245484 ISBN-13 9783658245481

Hernandez, J., (2020). *Database Design for Mere Mortals*. Addison-Wesley Professional.
ISBN 0136788041 ISBN-13 9780136788041

Hoffer, A., Ramesh, V., Topi, H., (2019). *Modern Database Management*.
ISBN 0134773659 ISBN-13 9780134773650

Online Resources

Sqlzoo.net

w3schools.com

techonthenet.com

tutorialspoint.com/sql

academy.oracle.com

Programme Membership

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COMP06086 2023
Python Scripting

Elective Delivered in Stage 2 Semester 4

Full Title	Python Scripting		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Comp Science & Applied Physics		
Module Author	Jade Lyons		
Co Authors	Carine Gachon		

Module Description

This subject will introduce the learners scripting. Learners will design and implement object oriented programs for use in the administration of server systems.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Create scripts implementing data structures as appropriate to the business use case
2.	Create objects which implement object relationships with reference to efficient code.
3.	Apply basic error handling and debugging techniques
4.	Evaluate and implement best practices for scripted programs.

Indicative Syllabus

1. Introduction to Scripting

- Development IDE and Frameworks
- Development methodologies
- Debugging
- Scripting best practices

2. Data Access

- Built in/native data types, data in a series
- I/O Operations, files and data streams
- CSV, JSON

3. **Error Handling**

- Exception types
- Handling exceptions
- Clean-up actions

4. **OO Concepts**

- Inheritance, Abstract Classes
- Polymorphism
- Design Patterns

Teaching and Learning Strategy

This module will consist of 60% coursework and 40% exam.

Coursework may comprise of

- Laboratory practical work assessed using formal lab books
- Projects
- Group work

Assessment Strategy

Coursework	**60%**

Final Exam **40%**

Learning outcome	Addressed by	
	Exam	**Coursework**
1	√	√
2	√	√
3	√	√
4	√	√

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assignment	The student will create a solution to a given business problem utilizing techniques demonstrated in class.	30 %	End of Semester	1,2,3,4
Assignment	The student will create a solution to a given business problem utilizing techniques demonstrated in class.	30 %	End of Semester	1,2,3,4

End of Semester / Year Formal Exam:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	40 %	End of Semester	1,2,3,4

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	1	Weekly
Practical	Lab/Studio/ Practical	Computer Laboratory	3	Weekly
Independent Learning	Independent Learning	Not Specified	4	Weekly

Required Reading Book List

Matthes, E., (2019). *Python Crash Course, 2nd Edition*. No Starch Press.
ISBN 9781593279288 ISBN-13 1593279280

Horstmann, S., (2019). *Python for Everyone.*
ISBN 1119638291 ISBN-13 9781119638292

Sweigart, AL., (2019). *Automate the Boring Stuff with Python, 2nd Edition* . No Starch Press.
ISBN 9781593279929 ISBN-13 1593279922

Lott, F., Phillips, D., (2021). *Python Object-Oriented Programming - Fourth Edition*.
ISBN 1801077266 ISBN-13 9781801077262

Journal Resources

Journal articles in IEEE and ACM

Online Resources

www.python.org & www.python.ie

http://perl-begin.org/

https://www.owasp.org/index.php/Main_Page

http://www.fullstackpython.com/configuration-management.html

Programme Membership

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Atlantic Technological University

COMP06085 2023
Computer Architecture and Operating Systems 2

Elective Delivered in Stage 2 Semester 4

Full Title	Computer Architecture and Operating Systems 2		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	06	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Comp Science & Applied Physics		
Module Author	Jade Lyons		
Co Authors	Carine Gachon		

Module Description

To introduce the learner to the four fundamental functions of the modern operating system and how the four functions relate to the execution of user programs and also the underlying hardware.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Recognise and describe the four fundamental functions of a modern operating system as a platform for the execution of user programs – process management; memory management; file-systems; and device management.
2.	Relate the work of the operating system in terms of its four fundamental functions to the hardware of the computer.
3.	Operate and administer a Linux operating system with awareness of the underlying function, structure and constraints of the operating system.

Indicative Syllabus

Key Features of a Modern Operating System

- Relationship to underlying hardware – abstraction and protection.
- Four key functions: process management, memory management, file-systems and device management.
- The ecology of the operating system: the kernel, executing processes, system calls and software libraries.
- Fundamental design principles for modern operating systems: protection, performance, isolation, reliability and security.

Process Management

- Process Life Cycle
- Process scheduling – algorithms and evaluation
- Threads and parallelism

Memory Management

- The Memory Hierarchy
- Paging as resource management in a multi-tasking system.
- Virtual Memory – the virtual address space and libraries

The File-System

- Files and directories – data and meta-data.
- FAT vs. i-nodes.
- Implementing files and directories.

Device I/O Management

- I/O Devices and Device Drivers
- I/O Controllers and I/O Buffering
- Interrupts, Traps & System Calls

Teaching and Learning Strategy

Lecturers will use an active learning approach that encourages students to actively engage in the learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of computer architecture and operating systems concepts. Students will be exposed to real-world problems and scenarios related to computer architecture and operating systems. This approach allows students to apply theoretical knowledge to practical situations, enhancing their problem-solving and critical thinking skills.

Assessment Strategy

Coursework	**50%**

Final Exam **50%**

Learning outcome	Addressed by	
	Exam	**Coursework**
1	x	x
2	x	x
3		x

Repeat Assessment Strategies
Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Installation of Linux onto computer system.	10 %	End of Semester	3
Assessment	Command Line Language Class Test on Linux virtual machine.	25 %	End of Semester	2,3
Assessment	Shell programming test on Linux virtual machine	15 %	End of Semester	3

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Examination	50 %	End of Semester	1,2

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	1	Weekly
Tutorial	Tutorial	Lecture Theatre	1	Weekly
Practical	Lab/ Studio/ Practical	Computer Laboratory	2	Weekly
Independent Learning	Independent Learning	Not Specified	4	Weekly

Required Reading Book List
Silberschatz, A., Galvin, B., Gagne, G., (2018). *Operating System Concepts*. ISBN 1119456339 ISBN-13 9781119456339
Shotts, W., (2019). *The Linux Command Line, 2nd Edition*. No Starch Press. ISBN 9781593279523 ISBN-13 1593279523
Ward, B., (2021). *How Linux Works, 3rd Edition*. No Starch Press. ISBN 9781718500402 ISBN-13 1718500408

Recommended Reading Book List
Arpaci-Dusseau, H., (2018). *Operating Systems: Three Easy Pieces* . 1st Edition. CreateSpace Independent Publishing Platform.

Online Resources
https://ubuntu.com/community
https://www.linuxandubuntu.com/home/top-10-communities-to-help-you-learn-linux

Other Resources
IEEE Database
ACM Database

Programme Membership

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Stage 3 Modules

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WORK07026 2023
Engineering Work Experience

Mandatory Delivered in Stage 3 Year Long

Full Title	Engineering Work Experience		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	25
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		
Co Authors	Oliver Mulryan, David Keary, Michelle McGuinness		

Module Description

Prior to Work Experience this module will develop the learner professionally and personally and equip them with the skills and knowledge to enable them to secure a work placement. Learners will gain knowledge and skills in relation to the recruitment and selection process by refining their Cvs' and completing mock interviews prior to commencing in the workplace.

During Work Experience this module allows the learner to put the engineering knowledge, skills, tools and techniques acquired in their Manufacturing engineering / Biomedical programme into practice within a working environment.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Analyse personal skills and characteristics and develop a CV related to Work Experience career strategy.
2.	Present and articulate their skills and experience professionally in an interview situation.
3.	Apply the engineering knowledge, tools and theory, learned on their chosen programme to the solution of broadly defined engineering problems.
4.	Demonstrate an understanding of their role as an engineer Industry by operating as an effective team member.
5.	Solve assigned engineering problems in a methodical, proactive and creative manner, with minimum supervision.
6.	Apply Project Management skills to manage his or her time and projects.
7.	Report their work clearly in written and in oral format.
8.	Apply the Engineers Ireland Code of Ethics
9.	Reflect on their practice and propose improvements.

Indicative Syllabus

Work Placement will consist of a specified minimum period of 15 weeks in a workplace relevant to the core qualification of their programme. Ultimately the onus is on the student to acquire Work Placement, students are encouraged to utilise any contacts they have in industry to secure a Work Placement while also a number of external Work Placements may be where possible organised between companies with suitable posts (i.e. arising from lecturer engagement with industry).

Students that fail to engage in the process (CV Preparation, Interview Preparation & Meetings) shall not be prioritised when securing external Placements through ATU.

Marking

The placement will be marked based on the deliverables completed. An indication of deliverables is included in the coursework assessment overview.

External Placement

The placement shall contain suitable Engineering content/practices.

External Work Placements may be where possible organised between suitable companies (i.e. an industrial contact) and students with the assistance of the assigned lecturer/ co-ordinator. External companies and students will be matched through the interview process.

External Placement will be co-supervised by an academic and Workplace supervisor. For external Placements, during the Placement period, the student and Workplace supervisor may be visited by the academic supervisor. During this visit an assessment may be made by the academic and Workplace supervisor of the student's progress within the agreed programme and alterations, modifications or adjustments maybe be made as deemed necessary. Where visits are not possible an assessment shall be made remotely or through feedback forms.

Internal Placement

In the eventuality of a student failing to obtain external work placement, having regard to the learning outcomes of the module, internal work placement/project may be provided.

Placement Failsafe

As a failsafe for learners who fail to secure placement (External or Internal), an engineering work placement alternative consisting of career preparation & a project with equivalent ECTS credits will be provided. In this alternative, a group of learners (i.e. typically 3 or 4 learners) will have to provide the solution to a broadly defined engineering problem somewhat equivalent to an Industry project. This alternative will have elements of both informal and formal learning, the former of which will be also be assisted in the guise of guidance and help from the academic supervisor(s) over the period of January to May.

The student's responsibilities include the transformation of the project requirements into a viable project plan, the research and synthesis of current state of the art in the relevant technology / scientific areas and the subsequent design, where possible development and testing of a working prototype. The prototype can take the form of a physical model, an extensive report and presentation on product design and development, a software programme or a numerical simulation model. In the case of a project with a biased towards scientific research, (where it may not be possible to build a prototype) the implementation phase may be the development or evaluation of experimental case studies or other analytical techniques. The student has primary responsibility for project planning, management and reporting and is also required to make regular contact with their assigned project supervisor.

A schedule of project milestones, deliverables and deadlines will be given to the project members and these will be assessed via a series of reports, presentations and deliverables.

Students will be expected to gain skills that address the Work Experience learning outcomes.

Project teams may be made up of cross discipline students e.g. Manufacturing Engineering Design & Biomedical Students.

Teaching and Learning Strategy

Learners are assisted by a Lecturer, who will guide and support their CV & Placement process.

Worked based (which encompasses experiential based and lifelong learning), problem based and project based learning occurs naturally in the workplace environment. This module includes the student's reflection on the experience of work.

Assessment Strategy

Assessment includes a report and presentation on a technical project, a process study, a set of reflective logbooks, an evaluation from their supervisor and a reflection on the contribution of the work placement in achieving the Programme Learning Outcomes.

Students who do not fulfil their contract with the employer will automatically fail the module.

Repeat Assessment Strategies

Should the student not secure placement & not successfully complete the allocated project this module can only be repeated by Repeat and Attend.

If the Work Placement module is not passed by the learner due to a lack of engagement or disciplinary issues, then the module will have to be repeated in the next academic year.

If the student completed the work-experience aspect of the module but failed the assessments overall, then they will be given an opportunity to resubmit the assessments at the next sitting (the supervisor evaluation cannot be repeated).

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Written Report/Essay	CV Preparation	15 %	OnGoing	1,7,9
Oral Exam/Presentation	Mock Interview	10 %	OnGoing	2,7,9
Written Report/Essay	Log Book	15 %	OnGoing	3,4,6,7,8,9
Written Report/Essay	Process Study Report	10 %	End of Term	5,7
Written Report/Essay	Technical Project Report	20 %	End of Term	3,4,5,6,7,8
Oral Exam/Presentation	Placement Presentation	10 %	End of Term	2,4,7
Performance Evaluation	Supervisor's Review	10 %	End of Term	4,5,8
Essay	Reflection on learning outcomes	10 %	End of Term	3,4,5,6,7,8,9

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Supervision	Work Placement	Not Specified	0.33	Weekly

Recommended Reading Book List

Baura, G., (2006). *Engineering Ethics: An Industrial perspective*. Academic Press.
ISBN 012088531X ISBN-13 9780120885312

Kosky, P., (2012). *Exploring Engineering, Third Edition: An Introduction to Engineering and Design* . Academic Press.
ISBN 0124158919 ISBN-13 9780124158917

Perkins, G., (2006). *Killer CVs and Hidden Approaches*. Pearson Education.
ISBN 0273710206 ISBN-13 9780273710202

Leigh, J., (2004). *CVs and Job Applications*. Oxford University Press, USA.
ISBN 0198606141 ISBN-13 9780198606147

Online Resources

Learnonline.gmit.ie materials

Other Resources
Interview techniques DVDs - GMIT library

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP07136 2023
Power and Energy Engineering

Elective Delivered in Stage 3 Year Long

Full Title	Power and Energy Engineering		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	David Mulligan		
Co Authors	Carine Gachon, Jade Lyons		

Module Description

This L7 Module address two key areas of energy management and ac power systems for Data Centres. The module had two sub-components as follows:

Energy Management:

The core principles of a structured approach to Energy Management including Energy MAP, ISO 50001. M&V protocols (IPMVP-2012), energy efficiency savings and independent variable analysis, introduction to principles of ISO50015

Power Systems for Data Centres:

The sub-component provides the learner with technical understanding principles of ac power distribution, structure of the power sector with generation, transmission, distribution, and supply of electricity. expands on power sector regulation and unbundling, Generation Fuel mix, integration of Renewable, wholesale and retailing of power, emerging trends in the sector including Smart Networks, vacuum & SF6 medium voltage switchgear, instrumentation transformers (CT/VTs), safety and switching permits for work, earthing procedures).

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	(KB,CC) Understand Power sector with EU backdrop to stimulate monopoly regulation and greater competition in the sector.
2.	(KB, CR) Demonstrate an appreciation of power generation transmission and distribution of electricity.
3.	(KB, CR, CC, KHSR) Demonstrate strong technical knowledge of quality and reliability metrics for power quality and reliability of supply, substation operation including trasnfomers and OLTC, Vacuum and SF6 switchgear, safety and earthing/permiting process/SOPs.
4.	(KB & CC) Understand ISO 50001 and structured approach to Energy Management.
5.	(KB, CR, KHSR) Demonstrate knowledge of Measurement & Verification process including use of Regression Analysis for determination of correlation of energy use with independent variables including HDD/CDD.
6.	(KB, CR, CC, KHSR) Develope technical understanding of EVO IPMVP-2012 and role of ISO 50015
7.	(KB, CR, KHSR) Understanding of synergy between Environment and Power including GHG, EPA Licensing, and waster/emissions management.

Indicative Syllabus

Power Engineering

Power generation including types of fossil fuel power plant (OC & CCGT) and Renwables. Transmission and Distribution of electricity. Grid and Mesh networks including design/operation to provide high system security. Structure of power sector and Role and legal context of EU reforms including unbundling and regulation of the sector. Technical information including metrics for power quality and reliability assessment. Overview of published transmission Grid plan and System Performance. Regulatory codes for netwrok operators.

Energy Management

Structured approach to Energy Management with emphasis on Data Centres (PUE) and EnergyMAP. ISO 50001. Measurement and Verification for energy performance and/or savings. Understanding of IPMVP-2012 from EVO including using EXCEL for regression analysis with single or multiple independent variables (ANOVA).

Module concludes with demonstration of the synergy with Environment Management with inclusion of EPA role, IPC Licensing, GHG/Emissions trading, waste management and policy drivers in this area.

In summary, this module addresses the power utility supply to data centre and also provides the learner with the framework and tools in the industry to manage energy based on the structured approach as exemplifies in ISO 50001 and measurement/verification using EVO protocol approach.

Teaching and Learning Strategy

Learning will be blended and comprise of evening weekly live or recorded online lectures, most likely using moodle and Adobe Connect with continuos assessment based on an individual case study of energy assessment report for data centre, site visit to large industrial site or Grid National Control Centre with resulting assessment report by learner. The assessment of data centre will introduce the core concepts of structured approach to energy management and performance with P-D-C-A methodology used. The energy assessment will be the basis of the practical for this module and include assessment of existing energy performance including PEU, identification of EE opportunity and implementation plan based on low cost, medium and investment to improve energy performance.

Assessment Strategy

Exam and Lab

Repeat Assessment Strategies

Repeat Exam and Repeat Labs at next available sitting, please note this may be in the next academic year.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Lab Report	Lab	50 %	Week 8	1,2,3,4

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Exam	50 %	End of Semester	4,5,6,7

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Lecture	Online	1	Weekly
Practical	Practical Labs	Engineering Laboratory	36	Once Per Module

Required Reading Book List

Guyer, J., (2019). *An Introduction to Energy Efficiency for Data Centers*.
ISBN 1079948422 ISBN-13 9781079948424

Jiang, T., Yu, L., Cao, Y., (2015). *Energy Management of Internet Data Centers in Smart Grid*. Springer.
ISBN 3662456753 ISBN-13 9783662456750

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ELEC07094 2020
Robotics and Control

Elective Delivered in Stage 3 Semester 5

Full Title	Robotics and Control		
Status	Uploaded to Banner	**Start Term**	2020
NFQ Level	07	**ECTS Credits**	10
Delivery Mode	Semester 1	**Duration**	15 weeks - (15 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Eilish Zaletel		
Co Authors	Paul ODowd, Oliver Mulryan, Michelle McGuinness		

Module Description

Sensors: The student will gain an understanding of electrical, electronic and mechanical sensors/actuators, including their required signal–conditioning and digital interfacing to acquire and analyse data.

Control Theory: This module introduces control in the engineering context and studies mechanical, electrical and fluid systems using block-diagram methodology. Open loop and closed loop systems are studied. Concepts such as feedback, steady state error, disturbances, ON/OFF controllers, proportional, integral and derivative controllers will be examined to show that proper control system design leads to systems that are efficiently and adequately controlled.

Industrial Robots: Definition and classification of robots. Robot anatomy: joints and links, control systems, end effectors, sensors in robotic applications. Robotic maintenance and safety. Application of industrial and materials handling robots. Vision systems

Robotic Programming: Lead-through Programming, use of Teach Pendant. Simulation and practical robotic applications

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe the principle of operation and characteristics of sensors and actuators
2.	Identify the components of data acquisition including signal conditioning and digital interfacing.
3.	Use appropriate technologies and software programming packages to measure, analyse and control systems
4.	Analyse control concepts including open loop, closed loop, relays, motor control, sequential control, process control, PID control.
5.	Recognise the environments in which control systems operate and be aware of steady-state error, stability and speed of response of the system.
6.	Investigate robotic capability, technology and anatomy
7.	Develop and execute robotic simulation programmes; and practical training using 5 and/or 6 axis robots.

Indicative Syllabus

Types of sensors: Position/displacement/proximity, potentiometer, LVDT, strain, temperature (thermocouples, RTDs, thermistors), pressure, liquid level, heat flux, fluid flow sensors. Digital/analog. Passive/Active

Sensor Characteristics: precision, accuracy, hysteresis loop, sensitivity, calibration, linearity

Data Acquisition: Types of Signal Conditioning: filtering, amplification, isolation, linearization, multiplexing, excitation. Field Wiring and Signal Measurement, Grounding signal sources. differential measurement and single ended measurement, ground loops, isolation. Noise and Interference. Serial/Parallel Communication. Plug-in data acquisition boards: A/D Boards, D/A Boards, distributed and stand-alone loggers/controllers.

Control Theory: Constructing System Models using Block Diagrams, Control concepts: Open-loop, closed loop and sequential control systems, mechatronics systems, basic system models: mechanical, electrical and fluid and thermal.

Controllers: ON/OFF controllers, Relays, Motor Controllers, Proportional, Integral and Derivative (PID) Control.

Industrial Robots: Definition and classification of robots. Robot anatomy: joints and links, control systems, end effectors, sensors in robotic applications. Robotic maintenance and safety. Application of industrial and materials handling robots

Robotic Programming: Simulate basic robotic pick and place sequences. Leadthrough Programming, use of Teach Pendant. Study of existing robot and practical robotic applications

Teaching and Learning Strategy

The module is a mix of theory and practical knowledge.

In the labs, students will use current technologies to measure, record, analyse and control systems.

The robot will be demonstrated and the students will create simulations using robotic programming languages.

The theory will be taught in formal lectures.

Assessment Strategy

Instrumentation and Control is a "Type 1" apprenticeship module. It is 100% assessed during the Academic Block.

60% ongoing assignments (data acquisition and analysis, control methodologies, robot programming)

40% end of exam-type assessment

Repeat Assessment Strategies

Students will be given the opportunity to take a repeat examination.

Additional Facilities

Robot programming software.

Indicative Coursework and Continuous Assessment:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Practical Evaluation	Lab assessments	60 %	OnGoing	1,2,3,4,5,7

End of Semester / Year Formal Exam:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam End of term exam	40 %	End of Semester	1,2,4,5,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Tiered Classroom	1	Weekly
Practical	Laboratory	Engineering Laboratory	4	Weekly

Recommended Reading Book List

Bolton, W., (2009). *Mechatronics: A Multidisciplinary Approach (4th Edition)* . Prentice Hall.
ISBN 0132407639 ISBN-13 9780132407632

Groover, P., (2007). *Automation, Production Systems, and Computer-Integrated Manufacturing (3rd Edition)*. Prentice Hall.
ISBN 0132393212 ISBN-13 9780132393218

Bolton, W., (2013). *Mechatronics: Electronic control systems in mechanical and electrical engineering (5th Edition)* . Prentice Hall.
ISBN 0273742868 ISBN-13 9780273742869

Nise, S., (2014). *Control Systems Engineering, 7th Edition*. Wiley.

Literary Resources

Control Systems Engineering, 7th Edition by Norman S. Nise , ISBN-13: 978-1118170519

Handbook of Modern Sensors: Physics, Designs, and Applications 4th ed. 2010 Edition, by Jacob Fraden, ISBN-13: 978-1441964656

Automation, Production Systems and Computer-Intergrated Manufacturing, Groover, 3rd edition 2007

Other Resources

None

Programme Membership

GA_EMAJG_B07 202000 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)

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Atlantic Technological University

ENGI07063 2023
Project Management (Apprenticeship)

Elective Delivered in Stage 3 Semester 5

Full Title	Project Management (Apprenticeship)		
Status	Uploaded to Banner	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Paul ODowd		
Co Authors	Carine Gachon, Tom Roche		

Module Description

This module introduces students to tools and methodologies of project management. Students will apply the skills and knowledge gained in the module to the technical project of their Industry module.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Articulate and explain structured approaches to project planning and management.
2.	Apply the principles, methodologies , tools and techniques of project management, including associated financial analysis.
3.	Use Project management software to assist in planning and managing projects.
4.	Define, plan and manage team-based projects
5.	Communicate effectively throughout the project lifecycle, including all necessary reports and presentations required in project planning and management in a real work environment

Indicative Syllabus

Review of international standards for project management.
Project Management Theory
• Why project management.
• Strategy, structure and culture.
• Project selection and portfolio management
• Leadership and the project management
• Scope management.
• Team building, conflict and negotiating.
• Risk management

• Cost estimation and budgeting

• Financial Justification of Projects (Payback method, Net Present Value, Rate of Return)

• Project scheduling
• Resource management
• Project evaluation and control
• Project close out and termination.

Introduction to project management software
• MS Project basics, project tasks and task relationships
• Outlining the project, managing resources
• Changing working time and scheduling resources
• Managing resource workloads
• Critical Path analysis

Application of Project Management to in class project.

Teaching and Learning Strategy

- Direct instruction (lectures)
- Activity based learning (individual and or team based projects)
- Independent learning (preparation of initial project plan for their technical report delivered in the industry block).

- Thinking skills approach (problem solving)

Activity-based learning will be combined with direct instruction to deliver project management skills. In addition, students will be supported by the lecturer in the Academic Block to prepare for the project management section in the Technical Project report, (delivered in the Industrial Block).

Students may be required to submit for feedback an Initial Project Plan for their Technical Project report. They will be expected to submit a draft of the Project Plan for feedback during the Industry Block, prior to the final submission of the Technical Project report

Assessment Strategy

Project Management is a "Type 3" apprenticeship module. It is 30% assessed during the Academic Block through ongoing assessments or project work (individual or team-based). These may include preparation of an Initial Project Plan for the Technical Project in the Industry Block.

Another 20% of the marks are for work done in the Industry Block. The Industry Block assessment is integrated with the Technical Project (looking at the Project Management aspects).A further 50% of the marks are for an "exam-format" assessment that takes place towards the end of the Industry Block. This "exam-format" assessment, includes questions which are based on learning gained in the workplace. For example, questions may refer to learning gained through the Technical Project. Students are asked to refer to examples of theory, tools and techniques used in their own company.

Repeat Assessment Strategies

Students can re-submit their Technical Project Plan (worth 20 % of the module).

A repeat examination will be offered.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Project	30 %	OnGoing	1,2,3,4,5
Project	Industry Project	20 %	OnGoing	2,3

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Exam	50 %	End of Term	1,2

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Tiered Classroom	1	Weekly
Practical	Laboratory	Engineering Laboratory	2	Weekly
Supervision	Industry project support	Not Specified	0.05	Weekly

Required Reading Book List

Pinto, K., (2012). *Project Management*.
ISBN 0273767429 ISBN-13 9780273767428

Lester, A., (2017). *Project Management, Planning and Control*. Butterworth-Heinemann.
ISBN 0081020201 ISBN-13 9780081020203

Johnson, D., (2010). *Microsoft Project 2010 Step by Step*. Pearson Education.
ISBN 9780735626959 ISBN-13 0735626952

Maylor, H., (2003). *Project Management*. Financial Times Management.
ISBN 0273655418 ISBN-13 9780273655411

Online Resources

https://www.projectmanagementdocs.com

https://www.pmi.org/

Programme Membership

GA_EMAPG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAJG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)

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Atlantic Technological University

ENGI07056 2022
Manufacturing Process Planning

Elective Delivered in Stage 3 Semester 5

Full Title	Manufacturing Process Planning		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	07	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Doru Boblea		
Co Authors	Carine Gachon, Paul ODowd, Oliver Mulryan		

Module Description

The aims of this module are

- to help the students develop an understanding of the underlying knowledge and related methods of Process Planning and Computer Aided Process Planning, and
- to equip the students with the skills required in carrying out the process planning (PP) function.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe the process planning functions, the role of process planning in manufacturing, the characteristics of traditional and Computer Aided Process Planning (CAPP) systems, the structure of typical CAPP systems and Group Technology (GT).
2.	Implement Manual Process Planning system in consideration of process planning criteria, and industrial considerations.
3.	Implement Computer Aided Process Planning (CAPP) systems in consideration of process planning criteria, and industrial considerations
4.	Identify relevant principles of Design for Manufacture and Assembly (DFMA), philosophy, implementation and functionality, assembly systems and costing
5.	Identify issues relevant to green manufacturing, design for environment and recycling, part life cycle assessment, sustainability.

Indicative Syllabus

- Traditional Process Planning (PP) Systems and Computer Aided Process Planning (CAPP) Systems.
- Manual Process Planning: drawing interpretation, material evaluation and process selection, machines and tooling selection, process parameters, work holding devices, quality assurance methods selection, costing and process planning documentation.
- Computer Aided Process Planning (CAPP) and Group Technology (GT)
- Design for Manufacture and Assembly (DFMA), Assembly Systems and Costing
- Green Manufacturing and Sustainability

Teaching and Learning Strategy

This module requires to cover the selection of processes, equipment, tooling and the sequencing of operations required to transform a chosen raw material into a finished product. The content reviews materials and processes for manufacturing and details the core activities involved in process planning, from drawing interpretation to preparing the final process plan. Therefore, the theoretical content will be covered through lectures and its application will be delivered through cases studies in laboratories and also with a project.

Assessment Strategy

Manufacturing Process Planning is a "Type 2" apprenticeship module. It is 80% assessed during the Academic Block. Another 20% of the marks are for work done in the Industry Block. The Industry Block assessment is integrated with the Process Study, where possible.

The assessment strategy of this module will be a combination of:

- Ongoing assessments,
- Examination,
- Industry project.

Repeat Assessment Strategies

Students will be given the opportunity to take a repeat examination.

Indicative Coursework and Continuous Assessment:	**60 %**

Form	*Title*	*Percent*	*Week (Indicative)*	*Learning Outcomes*
Assessment	In class/lab assessment	40 %	OnGoing	1,3,4
Project	Industry project	20 %	OnGoing	5

End of Semester / Year Formal Exam:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Exam-type assessment	40 %	End of Semester	2

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Theory	Not Specified	2	Weekly
Practical	Practical	Computer Laboratory	1	Weekly
Supervision	Industry project	Not Specified	0.05	Weekly

Part Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Not Specified	1	Weekly
Practical	Practical	Computer Laboratory	0.5	Weekly

Required Reading Book List

Bsc, P., (2003). *Process Planning: The design/manufacture interface*. Butterworth-Heinemann.
ISBN 0750651296 ISBN-13 9780750651295

Kesavan, R., (2008). *Process Planning and Cost Estimation* . New Age International Pvt Ltd Publishers.
ISBN 8122426050 ISBN-13 9788122426052

Kalpakjian, S., Schmid, R., (2010). *Manufacturing Engineering and Technology*.
ISBN 9810681445 ISBN-13 9789810681449

Programme Membership

GA_EMEDG_H08 202200 Bachelor of Engineering (Honours) in Manufacturing Engineering Design
GA_EMEDG_B07 202200 Bachelor of Engineering in Manufacturing Engineering Design
GA_EMAPG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)
GA_EMAJG_B07 202300 Bachelor of Engineering in Manufacturing Engineering (Apprenticeship)

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Atlantic Technological University

MANU07033 2022
Six Sigma Quality

Elective Delivered in Stage 3 Semester 5

Full Title	Six Sigma Quality		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	07	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Padraig Audley		
Co Authors	Carine Gachon, Paul ODowd, Oliver Mulryan, Martin Conneely, Michelle McGuinness		

Module Description

An introduction to Six Sigma, which will both explain the concepts and use of the techniques of Six Sigma.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Explain the Define, Measure, Analyse, Improve and Control steps in Six Sigma.
2.	Use 'Define' phase tools to decide on the process improvement of a Six Sigma project
3.	Determine the current performance using a variety of 'Measure' tools
4.	Use the 'Analyse' tools, including inferential statistics to determine the issues to be addressed.
5.	Use the 'Improve' tools, to experiment and assess the process optimisation.
6.	'Control' the process to verify the variances are corrected, select appropriate statistical process control (SPC) techniques.

Indicative Syllabus

Overview: Six Sigma and the Organisation, Six sigma and organisational goals, Lean principles in the organisation, Design for Six Sigma (DFSS) in the organisation, Quality Function Deployment (QFD) and failure mode and effect analysis (FMEA).

Six Sigma - *Define*: Process Management for Projects Project management basics : Business results for projects

Six Sigma - *Measure*: Process analysis and documentation, Collecting and summarising data, Probability and statistics, Six Sigma Measure: Measurement system analysis, Process capability and performance

Six Sigma - *Analyse*: Exploratory data analysis, Hypothesis testing (z, t p, F and Chi), inferential statistics and Analysis of variances (ANOVA)

Six Sigma - *Improve & Control* : implementing and validate solutions. Selection and application of Statistical process control (SPC)

Teaching and Learning Strategy

The module requires 1 hour theory and 2 hour practical/laboratory work in a computer laboratory.

The teaching and learning strategy will include: direct-instruction strategy (including lecture, repeating an activity, review and feedback); activity-based strategy (including practice); cooperative strategy (including group work); ICT-based strategy (including the use of a virtual learning environment: Moodle, Minitab, Excel and specific software); independent learning strategy (including homework and independent study); thinking-skills strategy (including problem-solving, graphing).

Assessment Strategy

The Mmodule will be 100% continuous assessment.

The assessment strategy will include: direct-instruction strategy (including lecture, repeating an activity, review and feedback); activity-based strategy (including practice); cooperative strategy (including group work); ICT-based strategy (including the use of a virtual learning environment: Moodle, Minitab, Excel and specific software); independent learning strategy (including homework and independent study); thinking-skills strategy (including problem-solving, graphing). Moodle Training Quizzes and Moodle Multiple Choice Quizzes

Repeat Assessment Strategies

Students who fail the module will be given the opportunity to take a repeat examination 50% and a repeat practical 30%.

Additional Facilities

Computer Laboratory, MS TEAMS, Minitab.

Indicative Coursework and Continuous Assessment:		100 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Multiple Choice/Short Answer Test	DMAIC Theory and Tools	50 %	OnGoing	1,2,3,4,5,6
Practical Evaluation	Minitab Practicals	30 %	OnGoing	3,4,5
Individual Project	Mini Project / case study	20 %	Week 13	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	Laboratory	Computer Laboratory	2	Weekly
Lecture	Lecture	Laboratory	1	Weekly

Required Reading Book List

Roderick, G., (2015). *The Certified Six Sigma Green Belt Handbook, Second Edition*. Quality Press.
ISBN 9780873898911 ISBN-13 0873898915

Brook, Q., *Lean Six SIGMA and Minitab*. 6th Edition. .
ISBN 0995789924 ISBN-13 9780995789920

Publishing, T., (2020). *Six Sigma Green Belt Study Guide*. Test Prep Books.
ISBN 1628457236 ISBN-13 9781628457230

Bass, I., *Six Sigma Statistics with EXCEL and MINITAB*. Edition. McGraw Hill Professional.
ISBN UOM:39076002655947

Recommended Reading Book List

Gygi, C., (2005). *Six Sigma For Dummies*. For Dummies.
ISBN 0764567985 ISBN-13 9780764567988

Online Resources

http://asq.org/index.aspx

Other Resources

Lecturers Moodle Page

Programme Membership

GA_EMEDG_H08 202200 Bachelor of Engineering (Honours) in Manufacturing Engineering Design
GA_EMEDG_B07 202200 Bachelor of Engineering in Manufacturing Engineering Design

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Atlantic Technological University

ENVI07025 2023
Sustainable Design 2

Elective Delivered in Stage 3 Semester 5

Full Title	Sustainable Design 2		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module will introduce students to system modelling and explore the potential conflict between financial and sustainable targets in the design of a system.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Examine the role of operations research, qualitative analysis, modelling and simulations play in the design of an effective and sustainable enterprise.
2.	Simulate and model a system to investigate the impact of sustainability targets on the financial viability of the system.
3.	Develop models and simulation of an organisation operations.

Indicative Syllabus

- Systems and Sustainability, Product, Service, Process and Plant Design
- Waste and Waste management
- Reverse logistic
- Inventory models and management
- Linear Programming
- Statistics and Simulation
- Operations mapping and Improvement Probability / Monte Carlo Modelling
- Queueing Systems Optimisation
- Theory and Simulation
- Operations Modelling and Simulation

Teaching and Learning Strategy

The teaching and learning strategy used include : A direct instruction strategy (including lecture, repeating an activity, review and feedback)

- An activity based strategy (including practice)
- A cooperate teamwork strategy
- An ICT based strategy (including the use of a virtual learning environment: Moodle and specific software) An independent learning strategy (including homework and independent study)
- Thinking skills strategy (including problem solving, graphing)
- On-line Videos
- Project based learning strategy- Model a reverse or forward logistic system and evaluate the impact on sustainability. Propose changes that would favour sustainability and evaluate the financial impact.

Assessment Strategy

The outcomes of each lab session are assessed, and these results are provided to the student on an ongoing basis. .

The module project is a group based project. This project is submitted at the end of the module delivery and the marks are included in the overall module mark.

Repeat Assessment Strategies

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Group Project	Project	60 %	End of Semester	2,3

Assignment	Continuous Assessment	40 %	OnGoing	1,2,3

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Practical	Practical	Computer Laboratory	3	Weekly

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP07134 2023
Data Ethics and Governance

Elective Delivered in Stage 3 Semester 5

Full Title	Data Ethics and Governance		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The increasing number of communication technologies— including the internet of things (IoT), wearables, ubiquitous sensing, social sharing platforms, and other artificial intelligence-driven systems—are contributing a tremendous amount of data at the individual company, and society level. These technologies offer enormous benefits but also pose enormous risks to individual privacy and ethical concerns. Further, easy access to data collected from online sources, analysed, and inferences drawn about individual users raise a wide range of ethical questions about these technologies, their sources, and their users.

In this course, students will evaluate major ethical questions raised by big data and related technologies. Students will learn about ethical inquiry strategies and decision points and consider how ethical frameworks can and should be applied to big data. They will work through case studies from real-world scenarios to implement legal frameworks, like the GDPR. They will also apply and examine various strategies to implement data governance to ensure clear milestones and trigger points for key stakeholders.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Justify and explain basic ethical and policy-based frameworks for working with big data and apply these frameworks to real-world cases.
2.	Discuss differences between shared values across data, ethics, and society.
3.	Articulate the framework for ethical inquiry strategies and decision points.
4.	Implement legal frameworks, like the GDPR, in the context of big data applications in business and government
5.	Apply data governance, ownership, data confidence, and data fit to make data governance work for a specific organization.
6.	Examine various ways to implement data governance to ensure clear milestones and trigger points for key stakeholders.

Indicative Syllabus

1. **Big Data, Big Impact**
   - Data in the Digital Age
   - Why Big Data?
   - What is Big Data forcing
   - Limited Access and Digital Divides
   - Global Standards for Data Ethics
2. **Ethical Framework for Evaluating Big Data**
   - Ethics Codes: History, Context, and Challenges
   - Articulating Your Values
   - Turning Values into Actions
   - Four Elements of Big-Data Ethics: Identity, Privacy, Ownership, and Reputation
   - Benefits of Ethical Inquiry
   - Ethical Decision Points
   - Ethical Incoherence
3. **Principles of Data Governance**
   - Understanding Data Governance
   - Owning Data Governance
   - Data Governance Purpose
   - Getting Data Fit
4. **Data Governance Stakeholders**
   - Data policy
   - Data Governance Scorecard
   - Approaches, practices, and methodologies
   - Data governance business drivers
   - Data governance challenges

- About metadata and blockchain

5. **Privacy Regulation**
   - EU GDPR (General Data Protection Regulation)
   - GDPR application to big data for business professionals
6. **Standards & Security**

   Standards e.g. ISO 27000, NIST

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and case study analyses that promote a deeper understanding of data ethics and governance concepts and challenges. Students will analyse real-world cases that highlight ethical dilemmas and governance issues related to data management, privacy, and security. This approach enables students to apply theoretical knowledge to practical situations, enhancing their problem-solving and critical thinking skills.

Assessment Strategy

The module will comprise 50% Coursework and 50% Final Exam.

Indicative Assessment

The assessments will serve to provide students with theoretical and practical familiarity with the pertinent ethical concerns experienced by individuals, organisations, and society. They will understand the principles of ethical governance with a focus on different ethical governance approaches, practices, and methodologies. Learners will engage with the process through weekly lab reports and will become acutely aware of the legal and ethical implications of the material through academic research. A good grasp on ethical issues and ethical frameworks will be attained by critically evaluating ethical inquiry, decision points, incoherence, and legal frameworks like GDPR through case studies.

Element No	Weighting	Type	Description	Learning Outcome Assessed
1	50%	Lab Reports	The student will produce a lab book based on practicals/discussions conducted and literature read. This lab book should outline methods used and draw conclusions.	1,2,3,4,5,6
2	50%	Implementation of national and EU legal frameworks, e.g., GDPR to big data for real-world business use cases.	The student will implement a national and EU legal frameworks on a given real-world business use case.	1,3,4

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	50 %	End of Semester	1,2,3,4,5,6

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	50 %	End of Semester	1,2,3,4,5,6

Full Time Delivery Mode:

Type	*Description*	*Location*	*Hours*	*Frequency*
Lecture	Lectures	Not Specified	1	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learning	Not Specified	5	Weekly

Required Reading Book List

Sen, H., (2019). *Data Governance*. Technics Publications.
ISBN 9781634624800 ISBN-13 1634624807

Davis, K., Patterson, D., (2012). *Ethics of Big Data*. "O'Reilly Media, Inc.".
ISBN 9781449311797 ISBN-13 1449311792

Hasselbalch, G., *Data Ethics- The New Competitive Advantage*. 2016 Edition[th] Edition. PubliShare.

Mike, H., *Ethics and Data Science*. 2018 Edition[th] Edition. O'Reilly.

And, E., *The ethics of Big Data: Balancing Economic Benefits and Ethical Questions of Big Data in the EU policy context* . 2017 Edition[th] Edition. EU publications.

Mittelstadt, B., Floridi, L., (2016). *The Ethics of Biomedical Big Data*. Springer.
ISBN 3319335235 ISBN-13 9783319335230

Other Resources

IEEE and ACM for current and topical material

LYIT library

Three Years of the Right to Be Forgotten:

https://elie.net/static/files/three-years-of-the-right-to-beforgotten/three-years-of-the-right-to-be-forgotten-paper.pdf

What the GDPR means for Facebook, the EU and you:

https://www.cnet.com/how-to/what-gdpr-means-for-facebookgoogle-the-eu-us-and-you/

Warren, S., & Brandeis, L. (1890). The right to privacy. *Harvard Law*

Review.

Tech companies are open to privacy regulations. Congress should act. *Washington Post*:

https://www.washingtonpost.com/opinions/facebook-is-failing-itsown-test-time-for-national-privacy-rules-fortech/2018/09/28/bc605fac-c1d5-11e8-a1f0-sa4051b6ad114_story.html?utm_term=.d54442a91d58

The Right to be Forgotten or the Duty to be Remembered? Twitter data reuse and implications for user privacy. *The Council for Big Data, Ethics, and Society.*

The Real Privacy Problem. MIT Technology Review (2013).

https://www.technologyreview.com/s/520426/the-real-privacyproblem/

Engaging the Ethics of Data Science in Practice. Communications of the ACM: https://cacm.acm.org/magazines/2017/11/222176-engaging-the-ethics-of-data-science-in-practice/fulltext

Anonymity and the Netflix Dataset:

https://www.schneier.com/blog/archives/2007/12/anonymity_and_t_2.html

ACM's Code of Ethics: https://www.acm.org/code-of-ethics

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP07132 2023
Green/Cloud Services Technology Management

Elective Delivered in Stage 3 Semester 5

Full Title	Green/Cloud Services Technology Management		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	10
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

To provide the student with an in-depth understanding of the tools and techniques applied to the optimal management of green data centres and cloud services.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Investigate alternatives for the provision of services in the context of economics, flexibility, functionality and scalability.
2.	Appreciate the importance of contract conditions and SLAs in ensuring the expectations of a cloud solution are met.
3.	Analyse the current market for cloud services, identifying key suppliers, trends and the availability of services.
4.	Understand and critically evaluate strategies for secure cloud service provision using detailed case studies.
5.	Appraise and implement services for suitability to particular business requirements.

Indicative Syllabus

1. Service Provision

- Economics, flexibility, functionality and scalability.
- Modelling dependencies.
- Data Centre Infrastructure Management (DCIM) Services

2. Service Level Agreements

- Web Service Level Agreement (WSLA)
- SLA Management Suites.
- Compliance with ITIL, WS-Management, EPI and other Standards

3. Service Markets

- Identifying key suppliers & trends.
- Marketing of services.
- Appraisal and implementation of services.

4. Strategies for Secure Service Provision

- Strategies for secure cloud service provision.
- Identity federation management for Services.

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of green cloud services technology management concepts. Students will work on real-world projects throughout the course, gaining hands-on experience in designing, implementing, and managing green cloud services. This practical experience will help students develop their green cloud technology management skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 50% Coursework and 50% Final Exam.

Coursework may comprise a mix of assessment approaches, such as: case studies, reports, practicals, presentations, portfolios, class tests, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

End of Semester Final Examination

The final written examination will be 3 hours in duration. It will normally comprise 6 questions of which the learner should attempt 4 questions.

Repeat Assessment Strategies
Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		50 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assesment	50 %	End of Semester	1,2,3,4,5

End of Semester / Year Formal Exam:		50 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	50 %	End of Semester	1,3,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lectures	Not Specified	2	Weekly
Practical	Lab/Studio/Practicals	Not Specified	4	Weekly
Independent Learning	Independent Learning	Not Specified	9	Weekly

Required Reading Book List
Kusnetzky, D., (2011). *Virtualization*. "O'Reilly Media, Inc.". ISBN 9781449306458 ISBN-13 1449306454
Schulz, G., (2009). *The Green and Virtual Data Center*. Auerbach Publications. ISBN 1420086669 ISBN-13 9781420086669
Sterling, D., Kumar, P., (2011). *Dancing on a Cloud*. Xlibris Corporation. ISBN 1465393668 ISBN-13 9781465393661
Spafford, G., (2008). *The Governance of Green IT*. IT Governance Ltd. ISBN 1905356749 ISBN-13 9781905356744
Winkler, R., (2011). *Securing the Cloud*. Syngress Press. ISBN 1597495921 ISBN-13 9781597495929

Other Resources
Cloud-Standards.org
IEEE Database
ACM Database
Webography:
http://java.sun.com/docs/books/tutorial/security/index.html
http://java.sun.com/javase/7/docs/technotes/guides/security/index.html

Programme Membership

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Atlantic Technological University

COMP07133 2023
Security and the Cloud

Elective Delivered in Stage 3 Semester 5

Full Title	Security and the Cloud		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	10
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The student will master the core principles that shape cloud solutions and will learn to efficiently execute secure code segments against data.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Critically analyse the Service Oriented Architecture and Cloud Computing paradigms.
2.	Implement and evaluate a service mashup.
3.	Critically analyse the enterprise models in cloud computing.
4.	Evaluate Software as a Service (SaaS) application
5.	Critically analyse the Security issues associated with the Cloud Computing paradigm.
6.	Evaluate the requirements for Outsourcing in a Cloud Environment.

Indicative Syllabus

1. Fundamentals of Cloud Services

- Origins of Cloud Computing
- Storage Connectivity
- Failure as a Feature

2. Making Software a Service

- Setting up the environment
- Data Layer analysis
- Developing applications/services
- Utilisation of appropriate cryptographic approaches

3. Cloud Design & Analysis

- Creating resources
- Creating handlers, configuring the application
- Creating templates, running the application

4. Exposing Vulnerabilities

- Software/Cloud Security testing, exposing vulnerabilities of existing standards or the cloud architecture itself

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of security concepts and challenges in cloud environments. Students will work on real-world projects throughout the course, gaining hands-on experience in designing, implementing, and managing secure cloud-based solutions. This practical experience will help students develop their cloud security skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 40% Coursework and 60% Final Exam.

Coursework may comprise a mix of assessment approaches, such as: reports, practicals, presentations, portfolios, class tests, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

End of Semester Final Examination

The final written examination will be 3 hours in duration. It will comprise 6 questions of which the learner should attempt 4 questions.

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	40 %	End of Semester	3,5

End of Semester / Year Formal Exam:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	60 %	End of Semester	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lectures	Not Specified	2	Weekly
Practical	Lab/Studio/Practicals	Not Specified	4	Weekly
Independent Learning	Independent Learning	Not Specified	9	Weekly

Required Reading Book List

Moyer, M., (2011). *Building Applications in the Cloud*. Addison-Wesley Professional.
ISBN 0321720202 ISBN-13 9780321720207

Josyula, V., Orr, M., Page, G., (2012). *Cloud Computing*. Cisco Press.
ISBN 9781587204340 ISBN-13 1587204347

Miller, M., (2008). *Cloud Computing*. Que Pub.
ISBN UOM:39076002801178

Other Resources

IEEE Database

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Atlantic Technological University

ENER07037 2023
Building Energy Performance

Elective Delivered in Stage 3 Semester 6

Full Title	Building Energy Performance		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	07	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	23 Weeks - (23 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

The aim of this module is to provide students with methodologies to estimate and measure energy performance of Non Residential Buildings.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Identify and describe current energy performance, building regulations, relevant metrics and theoretical background.
2.	Apply Building Energy Rating methodologies and software to Non Residential Buildings.
3.	Carry out an energy audit of a Non-Residential building, understanding where energy is consumed and identify significant energy users, such as heating/cooling system, lighting, equipment, refrigeration, etc.
4.	Prepare an energy audit report and make recommendations.

Indicative Syllabus

1. Building Fabric's Heat loss estimation (TGD part L)
2. Nearly Zero Energy Building (NZEB)
3. Energy Performance of a building and evaluation of PV and wind energy output (TGD part L)
4. Building energy auditing: rationale, approaches, methodologies, standards and reporting
5. The iSBEMie modeling tool (NEAP software) to show compliance with Part L and NZEB.
6. Building Energy Rating certificate for Non Resisdential buildings.
7. Identify opportunities for energy saving and use of renewable sources in the building. Prepare a sensitivity analysis of the recommendations.
8. Benchmarking a Building energy performance against best energy performance practice.

Teaching and Learning Strategy

This module will be delivered online with a mixture of flip classroom activities for the theory and online practical/workshops where students will gain hands-on experience of using the NEAP software and preparing documentations based on case studies.

Assessment Strategy

- 100% Assignment and project work

Repeat Assessment Strategies

Resubmit projects

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	U-value calculation assessment	10 %	Week 6	2
Project	BER and energy bills assessment of a dwelling	30 %	Week 12	1,2,3
Project	Energy audit and rating of a building other than dwelling	30 %	Week 20	1,3
Assessment	Building Sensor Systems	10 %	Week 13	4
Assessment	Energy analysis and Auditing	20 %	Week 18	4

Full Time Delivery Mode:

Type	*Description*	*Location*	*Hours*	*Frequency*
Online Learning	Lecture	Online	1	Weekly
Online Learning	Practical / Workshops	Online	2	Weekly

Literary Resources

- DEAP Manual, TGD part L;
- Al-Shemmeri, T. - Energy audits: a workbook for energy management in buildings, 2011;
- Beggs, Clive - Energy: management, supply and conservation, Oxford: Elsevier Butterworth-Heinemann, 2009;
- Bolton, William - Instrumentation and control systems, Amsterdam ; London : Elsevier, 2006;
- Handbook of Energy Audits by Thumann and Younger ISBN 0-88173-416-0
- Energy Audit of Building Systems: An Engineering Approach (The CRC Press Series in Mechanical and Aerospace Engineering) by Moncef Krarti - ISBN 9780849395871

Online Resources

http://www.seai.ie/Your_Building/BER/BER_Assessors/

Other Resources

Equipment available in the Energy lab and instrumentation kits

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Stage 4 Modules

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Atlantic Technological University

COMP08104 2023
Research in Computing with Emerging Technologies

Elective Delivered in Stage 4 Year Long

Full Title	Research in Computing with Emerging Technologies		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

This module will give students practice in academic research with the freedom to express their personal interests in the field of computing. Students will have an opportunity to critically analyse and synthesise pertinent literature regarding their area of exploration. Students will gain an appreciation of iterative development, critique and an ability to devise a plan for practical development.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Appraise and evaluate emerging trends from information sources and present findings.
2.	Develop and document detailed aims and objectives from preliminary research.
3.	Critically analyse and evaluate pertinent literature succinctly.
4.	Analyse advancements in technology with regard to their impact on research and industry.
5.	Develop and document a design solution using appropriate methodologies for the field of study.
6.	Develop and present a prototype of high academic and technical standard.

Indicative Syllabus

1. Academic Reviews
- Selection of various emerging trends based on research within academic journals and other relevant sources.
- Research concepts and methods.
- Presentation of findings adhering to academic standards.
- Critical writing.

2. Idea Generation
- Liaising with various academic staff (or other) to help validate and guide research ideas.
- Utilise various research and development methodologies such as breakout sessions and industry talks.
- Industry impacts

3. Documentation
- Preliminary research, rationale, feasibility and proposal.
- Scope and relevance to the field of study.
- Literature review.
- Design and plan for development.
- Preliminary outline of pertinent and required testing/evaluation strategies.

4. Prototype and Presentation
- Develop an artefact to address any potential technological issues.
- Standards and frameworks.
- Initial Testing.
- Presentation of research with a view to further development.

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of research methods and emerging technologies in computing. Students will be exposed to real-world problems and scenarios related to emerging technologies in computing. This approach allows students to apply theoretical knowledge to practical

situations, enhancing their problem-solving and critical thinking skills.

Assessment Strategy

This module will be 100% coursework. Coursework may comprise a mix of assessment approaches, such as: reports (formatively assessed before final submission), practicals, presentations and integrated assessment such as reflective journals. Details of the nature of assessment and submission dates are contained in the module handbook.

The assessments will serve to provide students with a 'hands-on' experience in looking at the range of emerging technologies in the field of computing. Learners will engage and experiment with this process academic writing and development through their reflective journals and iterations of documentation. Students will also be required to produce a porotype to validate the appropriateness of the selected technologies.

Repeat Assessment Strategies

Repeat coursework.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Reflective Journal	15 %	OnGoing	1,6
Assessment	Documentation	70 %	OnGoing	1,2,3,4,5
Assessment	Prototype & Presentation	15 %	OnGoing	5,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Not Specified	1	Weekly
Practical	Lab Practicals	Computer Laboratory	2	Weekly
Independent Learning	Independent Learning	Not Specified	11	Weekly

Recommended Reading Book List

Dawson, C., (2015). *Projects in Computing and Information Systems*. Prentice Hall.
ISBN 1292073462 ISBN-13 9781292073460

Senthil, A V., Rahman, H., (2012). *Mobile Computing Techniques in Emerging Markets*.
ISBN 1466600802 ISBN-13 9781466600805

Funatsu, K., (2011). *New Fundamental Technologies in Data Mining*. IntechOpen.
ISBN 9533075473 ISBN-13 9789533075471

Nielsen, F., (2009). *Emerging Trends in Visual Computing*. Springer Science & Business Media.
ISBN 9783642008252 ISBN-13 3642008259

Oates, J., (2006). *Researching Information Systems and Computing*. SAGE Publications Limited.
ISBN STANFORD:36105114568970

Dawson, W., (2000). *The Essence of Computing Projects*.
ISBN 013021972X ISBN-13 9780130219725

Online Resources

www.gartner.com/en/research/methodologies/gartner-hype-cycle
www.emergingtechs.com
www.lyitcomputing.com

Other Resources

IEEE Database
ACM Database
DOAJ
Gartner's Top Ten
LYIT library

Programme Membership

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Atlantic Technological University

MECH08016 2023
Major Project

Mandatory Delivered in Stage 4 Year Long

Full Title	Major Project		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

This module represents the work to be delivered independently by a student to the solution of a broadly defined engineering problem and therefore it objective is to assess their capabilities in executing a challenging project (i.e. time management skills, engineering knowledge, the ability to design, built, test and analyse a solution to a complex engineering problem, presentation skills, technical writing abilities etc.). The project provides the learner with an opportunity to integrate some of the theoretical and practical skills that they have gained across the years of the programme and therefore is a demonstrator of their capabilities. At the beginning of the academic year, learners select or propose a project and are allocated a supervisor (The duty of the supervisor is to guide and advise the learner throughout the project). A schedule of project milestones, deliverables and deadlines is also given to the learner and these are assessed at various agreed stages throughout the year.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Develop their ability to work as an individual, with the support of a supervisor.
2.	Apply the engineering knowledge and experience accumulated throughout the course to a specfic problem.
3.	Independently conduct research in a particular field of engineering using the leading publications,(Journal/conference Papers etc).
4.	Demonstrate the ability to develop original solutions to moderately complex engineering problems. Typically the student will design, built, test and analyse a solution to an engineering problem. The solution may be a physical artefact or a numerical simulation model.
5.	Develop and present a project plan which modularises the project into work packages. Identify the resources required to complete the work packages.
6.	Write a report, create a poster, develop a video and make a presentation on the work completed, including references and recommendations for future work.

Indicative Syllabus

Each student is expected to complete their own project throughout the final year with regular direction from their allocated supervisor.

The student's responsibilities include the transformation of the project requirements into a viable project plan, the research and synthesis of current state of the art in the relevant technology / scientific areas and the subsequent design, development and testing of a working prototype. The prototype can take the form of a physical model, a software programme or a numerical simulation model. In the case of a project with a biased towards scientific research, (where it may not be possible to build a prototype) the implementation phase may be the development or evaluation of experimental case studies or other analytical techniques. The student has primary responsibility for project planning, management and reporting and is also required to make regular contact with their assigned project supervisor.

A project specification document which details the aims and scope of the project will be provided to the student by the project supervisor. The following are the major project deliverables which each student must submit:

- Fully signed Supervisor/Student meeting sheet which records the frequency and duration of each meeting
- Final Project Thesis and Artefact at year end.
- Project Presentation\Demonstration\Oral Examination at end of year
- Development of a Poster and video for Exhibition at end of year.

Teaching and Learning Strategy

Students are provided with a supervisor, who will guide and support the work of the students through weekly meeting.

Assessment Strategy

Students are assessed by submitting written reports, a poster and a video and making presentations.

The breakdown of the marks are:

- Final Project Thesis 60%
- Poster 10%
- Final Presentation 20%
- Video 10%

Repeat Assessment Strategies
Students must resubmit all written reports, a poster, video and make presentations on their completed work.

Indicative Coursework and Continuous Assessment:		100 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Assessment as per assessment strategy	100 %	OnGoing	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Supervision	Supervision	Not Specified	0.33	Weekly
Lecture	Project preparation	Online	0.5	Weekly

Required Reading Book List
Dym, L., (2013). *Engineering Design*. John Wiley & Sons. ISBN 9781118324585 ISBN-13 1118324587
Lessard, C., Lessard, C., Lessard, P., (2007). *Project Management for Engineering Design*. Morgan & Claypool Publishers. ISBN 9781598291742 ISBN-13 1598291742

Other Resources
Access to Finite Element Software and Dynamic Thermal Simulation Software for domestic and commercial buildings

Programme Membership

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Atlantic Technological University

ENVI08009 2023
Sustainability and Governance

Mandatory Delivered in Stage 4 Semester 7

Full Title	Sustainability and Governance		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		

Module Description

The aim of this module is to familiarise the students with measure that can be taken to mitigate against the the potential impacts of climate change on business operations with a particular emphasis on SMEs.The module explores the national and international policies which are driving the sustainability agenda and how organisations can change and adapt in response to these challenges. Environmental and climate related legislation and and protocols are also examined at an EU and national level.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Evaluate the financial and organisational impacts of national and international sustainability targets on business operations.
2.	Analyse the main drivers and barriers to sustainability in organisational settings and articulate the role of leadership in relation to the design and implementation of successful sustainability initiatives.
3.	Evaluate current best practice approaches to business sustainability and integrate sustainability into organisational planning and practices.
4.	Develop a corporate social responsibility policy appropriate for a small to medium sized enterprise.
5.	Assess the environmental impact of a product/service/company.

Indicative Syllabus

The concept of Sustainability and sustainable development

The United Nations Sustainable Development Goals

The triple bottom line

Assessment of the environmental impact of a product/service/company: carbon footprint calculation, GHG protocol, LCA tools.

Corporate Social Responsibility

Sustainability Networks

Introduction to corporate governance and structures

Risk assessment and management

Scenario planning

Organisational Change

Change management

Barriers to corporate sustainability

Enablers and drivers of corporate sustainability

Effective leadership

Environmental leadership

Leadership in sustainability

Funding streams for sustainability initiatives

Ethics & Climate change

Teaching and Learning Strategy

The module will be delivered online whereby the students will engage with the module through a mixture of both face to face lectures/practicals and on-line learning.

The core material will be uploaded on a weekly basis and the student will be expected to engage with it, and become familiar with the fundamental concepts in each

area. A weekly on-line synchronous tutorial will be held where the lecturer will focus on key issues and concepts and engage with the students by answering questions and encouraging discursive dialogue.

It is intended that where practical, guest speakers will deliver lectures online. The aim is to expose the students to practitioners who can talk about and discuss the implementation of real world examples and applications of sustainability initiatives.

Assessment Strategy

This module will be assessed 100% continuous assessment.

The module is focussed on enabling student engagement with the range of challenges faced by businesses as a result of climate change and environmental degradation. The CA work is designed to assess the students ability to apply their learning in the development of real projects that address climate resilience for business.

Repeat Assessment Strategies

The submission of repeat continuous assessment work will be allowed subject to the normal rules of repeat module assessment.

Additional Facilities

Lectures will be online. Where possible specialist guest speakers will address the students and there will be a particular focus on case studies and exposing the students to real world examples of best practice.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assignment	Climate Resilience	30 %	OnGoing	1,5
Assignment	CSR Policy	20 %	End of Semester	4,5
Assignment	Climate Resilience for business Capstone CA	50 %	End of Term	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online asynchronous	Online	2	Weekly
Online Learning	Synchronous tutorial	Online	2	Weekly

Required Reading Book List

Solomon, J., (2010). *Corporate Governance and Accountability*. Wiley.
ISBN 0470695099 ISBN-13 9780470695098

Collette, H., (2018). *Cases in Corporate Governance and Business Ethics* . 1st Edition. Chartered Accountants Ireland.

O'Shea, R., (2016). *Leading with Integrity*.
ISBN 1910374652 ISBN-13 9781910374658

Al-Kalbani, M., (2015). *A Systems Approach to Environmental Management* . Dunedin Academic PressLtd.
ISBN 1780460260 ISBN-13 9781780460260

Duffy, D., (2014). *A Practical Guide to Corporate Governance* . 1st Edition. Chartered Acountants Ireland.

Recommended Reading Book List

Balkan, R., (2011). *Sustainable Supply Chain Management*. Springer Science & Business Media.
ISBN 3642120237 ISBN-13 9783642120237

Green, M., (2007). *Change Management Masterclass.* Kogan Page Publishers.
ISBN 0749445076 ISBN-13 9780749445072

Hughes, M., (2006). *Change Management.* Gardners Books.
ISBN 1843980703 ISBN-13 9781843980704

Mitchell, B., (2002). *Resource and Environmental Management*. Taylor & Francis.
ISBN 0130265322 ISBN-13 9780130265326

Mather, A., *Environmental Resources.* Longman Scientific and Technical.
ISBN STANFORD:36105017267803

Senge, M., (2006). *The Fifth Discipline.* Random House.
ISBN 9781905211203 ISBN-13 1905211201

Journal Resources

Environmental management

ISSN: 0364-152X, 1432-1009. Environmental Sciences.

Corporate Social Responsibility and Environmental Management

ISSN: 1535-3958, 1535-3966. Environmental Sciences, Management.

International Journal of Climate Change Strategies and Management

ISSN: 1756-8692, 1756-8706. Environmental Management & Protection.

Online Resources

Climate Change - Citizens Information

https://www.citizensinformation.ie/en/environment/environmental_protection/climate_change.html

The Department of Communications Climate Action and Environment

https://www.dccae.gov.ie/en-ie/Pages/default.aspx

Other Resources

Report of the Joint Committee on Climate Action,Climate Change: A Cross-Party Consensus for Action March 2019 (House of the Oireachtas)

The Climate Action Plan 2019 (Government of Ireland)

ISA 2600: 2010 Guidelines on Social Responsibility

Local Authority Adaption Strategy Development Guidelines December 2018 (Department of Communications, Climate Action and Environment)

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP08102 2023
Project Preparation

Mandatory Delivered in Stage 4 Semester 7

Full Title	Project Preparation		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The module will give students practice in academic research and the freedom to develop their personal interest in a field of sustainable engineering technologies. It will give students the experience of developing specifications and designing through research.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Develop and document detailed aims and objectives from preliminary research
2.	Independently research, review and document the project area
3.	Prepare a plan for a programme of work showing milestones, deliverables and phasing of tasks
4.	Develop specifications
5.	Prepare a design solution using a methodology appropriate to the task at hand
6.	Deliver a project report to high academic and technical standards

Indicative Syllabus

1. Report Writing

- Research concepts
- Research methods
- Notation systems
- Style guides

2. . Report Components

- Preliminary research, feasibility, project proposal; (10%)
- Project scope and plan (5%)
- Literature/Technology survey and analysis (45%)
- Specifications (10%)
- Design (20%)
- Oral presentation (10%)

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of project management concepts and techniques. Students will work on real-world projects throughout the course, gaining hands-on experience in project planning, management, and execution. This practical experience will help students develop their project management skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 100% Coursework.

Coursework culminates in a Project Report Document. The Learning outcomes correlate to required report contents.

Repeat Assessment Strategies

Repeat coursework.

Indicative Coursework and Continuous Assessment:		100 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	100 %	End of Semester	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Tutorial	Online	3	Weekly

Required Reading Book List
Dawson, W., (2000). *The Essence of Computing Projects*. ISBN 013021972X ISBN-13 9780130219725
Zobel, J., (2004). *Writing for Computer Science*. Taylor & Francis. ISBN 1852338024 ISBN-13 9781852338022
Dym, L., (2013). *Engineering Design*. John Wiley & Sons. ISBN 9781118324585 ISBN-13 1118324587
Lessard, C., Lessard, C., Lessard, P., (2007). *Project Management for Engineering Design*. Morgan & Claypool Publishers. ISBN 9781598291742 ISBN-13 1598291742

Other Resources
LYIT College Library research Databases

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

BUST08048 2022
Decision Theory and Data Visualisation

Elective Delivered in Stage 4 Semester 7

Full Title	Decision Theory and Data Visualisation		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		
Co Authors	Eamon Walsh, Trevor Clohessy, Rachael Shaw, Eoin Cullina		

Module Description

The objective of this module is to examine how different decision theories, decision tools and data analytical and data visualisation approaches can improve the performance of employees & organisations, and to decide the types of business problems that these theories, tools and approaches can best address. Learning materials include online videos, forum based discussions and problem based learning.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Critically evaluate the role of decision theory in enhancing employee and organisational performance as well as contributing to sustainable development goals
2.	Evaluate different decision-making methods, tools, visualisations and interactive dashboards
3.	Contrast the different data analytical, data visualisation tools and methods used by organisations
4.	Consider risk and uncertainty issues in decision making
5.	Critically evaluate different methods for managing risk and uncertainty
6.	Appraise how digital transformation can impact decision making and analysis

Indicative Syllabus

1. Introduction to Decision Making

Evaluate the potential impact of Big Data and Data Analytics on people, processes and sustainable development goals in a manufacturing context, and judge what are the most important characteristics of information.

2. Data Visualisation and Decision Making

Examine how visualisation impacts decision-making,

Recognise good practice in the data visualisation process, Contrast different tools and methods used for visualising data.

Evaluate good data communication processes when presenting and visualising data in the workplace.

3. Data Visualisation Technologies

Explore various data visualisation technologies, identifying and applying the various tools these technologies have to offer.

A specific data visualisation technology will be used to import and prepare data for visualisation purposes. Evaluate the role of interactive dashboards in complementing data visualisation solutions.

4. Heuristics, Biases and Framing in Decision Making

Contrast the different ways of making decisions, Recognise good practice in the decision-making process, Appraise the role of mental models in decision-making,

5. Decisions involving Multiple Objectives

Contrast different methods used in decisions involving multiple objectives, Evaluate the role of scenario planning and SMART in organisational decision-making.

6. Decision Trees and Influence Diagrams

Examine how decision trees and the roll back method can be used for identifying optimal policy.

Recognise practical applications of decision trees within decision analysis.

Propose influence diagrams as a method for facilitating decision structuring.

7. Decision Making Risk and Uncertainty Management

Examine risk and uncertainty in the context of decision analysis, Appraise the effectiveness of uncertainty management measures,

Propose structured approaches for uncertainty management.

8. Digital Transformation

Evaluate the impact of digital transformation on decision-making and analysis, Analyse future technologies and trends in decision theory and analysis.

9. Communication of results

Evaluate different strategies for communicating the outputs of analysis using visualisations and interactive dashboards to make it easy for users to interpret the data.

Teaching and Learning Strategy

The teaching and learning strategy (T&L) for this module will be tailored to achieve the following learning outcomes. The T&L strategy will involve the following six categories of learning activities including:

Acquisition – Reading digital websites, journals and blogs and watching video lectures.

Collaboration – Learners will mentor each other in terms of providing feedback on their weekly reflective tasks.

Discussion – Weekly reflective tasks and asynchronous learning.

Investigation - Learners will analyse the ideas and information from a range of digital sources.

Practice – Learners will engage in reflective tasks via weekly reflective exercises based on topics presented in the weekly lectures. The students will use data sets and case studies relevant to manufacturing.

Production – Applied assignments and projects that will involve the learners critically evaluating real life decision-making and data visualisation scenarios. The continuous assessments will be scaffolded whereby the various graded components will form inputs to an overall portfolio which is submitted by each student at the end of the module.

Assessment Strategy

- Applied assignments and projects that will involve the learners using module techniques and concepts to solve a real world decision-making and data visualisation problem with specific emphasis on the communication of results and insights.
- One project integrated in their main project where possible.

Repeat Assessment Strategies

Student to resubmit their project based on assessment outcome or submit a new project for the next assessment session.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Weekly Exercises	40 %	OnGoing	1,2,3,4,5,6
Individual Project	Project	60 %	Week 13	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online asynchronous activities	Online	3	Weekly
Online Learning	Online tutorial	Online	1	Weekly

Blended Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online asynchronous activities	Online	3	Weekly
Tutorial	Online tutorial	Online	1	Weekly

Required Reading Book List

Goodwin, P., (2014). *Decision Analysis for Management Judgment, Fifth Edition* . 5th Edition. Wiley.
ISBN 1118740734 ISBN-13 9781118740736

Knaflic, C., (2015). *Storytelling with Data: A Data Visualization Guide for Business Professionals* . John Wiley & Sons.
ISBN 1119002257 ISBN-13 9781119002253

Recommended Reading Book List

Winston, L., (2016). *Business Analytics: Data Analysis & Decision Making* . 6th Edition. Cengage Learning.
ISBN 9781305947542 ISBN-13 1305947541

Online Resources

https://www.wiley.com/en-us/Decision+Analysis+for+Management+Judgment%2C+5th+Edition-p-9781118740736

Other Resources

Other information resources will be provided by the instructor.

Programme Membership
GA_EAMSG_H08 202200 Bachelor of Engineering (Honours) in Advanced Manufacturing Systems GA_EADMG_L08 202200 Higher Diploma in Engineering in Automation and Digital Manufacturing GA_EADMG_H08 202200 Bachelor of Engineering (Honours) in Automation and Digital Manufacturing

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Atlantic Technological University

INFO08042 2022
Cloud Infrastructure and Enterprise Services

Elective Delivered in Stage 4 Semester 7

Full Title	Cloud Infrastructure and Enterprise Services		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Business & Accounting		
Module Author	Carine Gachon		
Co Authors	Trevor Clohessy, Rachael Shaw, Eoin Cullina		

Module Description

Upon completion of the module, the student will understand the transition from a traditional enterprise in-house environment to a Cloud based enterprise environment. This involves an examination of concepts such as virtualization at each layer – compute, storage, network, desktop, and application – along with business continuity in a Cloud environment. The student will understand Cloud computing fundamentals, infrastructure components, service management activities, security concerns, and considerations for Cloud adoption.

Current developments with respect to IS technologies and their impact on business models will also be examined; the student will have a knowledge of significant new technology approaches.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Evaluate the traditional Enterprise Infrastructure.
2.	Identify and implement a Virtualized Storage solution.
3.	Design and develop virtualization technology of compute, storage, network, desktop and application layers of IT infrastructure.
4.	Analyse business continuity solutions in a virtual data centre
5.	Analyse the key considerations for migration to the Cloud
6.	Investigate the emerging technology environment for manufacturing.

Indicative Syllabus

1. **Journey to the Cloud** – Business drivers for Cloud Computing, Definitions of Cloud Computing, Cloud Infrastructure Development, and Transition to the Cloud.
2. **Virtualized Data Centre VDC** - Compute Virtualization, Virtual Machine Components, Resource Management, Storage Virtualization, and Networked Virtualization including VLANS and SLANs, Desktop Virtualization, Application Virtualization.
3. **Business Continuity in VDC** – Technology Options, Mechanisms to protect potential points of failure.
4. **Cloud Services** – Cloud Services Model, Deployment Models, Economics of Cloud infrastructure and deployment.
5. **Cloud Security** - Security concerns and counter-measures, access control and identify management, goverance and risk. Cloud security best practices.
6. **IoT** integration to the cloud
7. Emerging technologies in manufacturing (blockchain, AI, etc..)

Teaching and Learning Strategy

The teaching and learning strategy (T&L) for this module will be tailored to achieve the following learning outcomes. The T&L strategy will involve the following six categories of learning activities including:

Acquisition – Reading digital websites, journals and blogs and watching video lectures.

Collaboration – Learners will collaborate on a practical cloud computing deployment project.

Discussion – Weekly reflective tasks and synchronous and asynchronous learning.

Investigation – Learners will analyse the ideas and information from a range of digital sources.

Practice – Learners will engage in reflective tasks via weekly reflective exercises based on topics presented in the weekly theory and practical lectures. They will apply their knowledge to a practical exercises and a project.

Production – Applied assignments and projects that will involve the learners critically evaluating real life cloud computing deployment and adoption scenarios. The continuous assessments will be scaffolded whereby the various graded components will form inputs to an overall portfolio which is submitted by each student at the end of the module.

Assessment Strategy

This module will comprise a continuous assessment project which is worth 70% and multiple-choice questions (MCQ) which will be administered over course of the module totalling 30%. Each MCQ will be worth 10%.

Repeat Assessment Strategies

Student to resubmit their project based on assessment outcome or submit a new project for the next assessment session.

Additional Facilities

The labs for the module will require virtualisation software and external access to Cloud storage and services.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Cloud Computing Fundamentals	30 %	OnGoing	1,4,5
Project	Cloud Services, Security and Business Continuity	70 %	Week 13	1,2,3,4,5,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online asynchronous activities	Online	3	Weekly
Online Learning	Online tutorial	Online	1	Weekly

Blended Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online asynchronous activities	Online	3	Weekly
Tutorial	Online tutorial	Online	1	Weekly

Required Reading Book List

Jamsa, K., (2012). *Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More* . Jones & Bartlett Learning.
ISBN 1449647391 ISBN-13 9781449647391

Lynn, T., *Measuring the Business Value of Cloud Computing* . Springer Nature.
ISBN 9783030431983 ISBN-13 3030431983

Cheshire, J., (2019). *Exam Ref Az-900 Microsoft Azure Fundamentals*. Microsoft Press.
ISBN 0135732182 ISBN-13 9780135732182

Journal Resources

Additional resources will be provided by the instructor

Online Resources

- www.acm.org
- www.ieee.org
- https://azure.microsoft.com/en-us/
- https://www.ibm.com/cloud/learn/cloud-computing
- https://aws.amazon.com/

Other Resources

Additional resources will be provided by the instructor

Programme Membership

GA_EAMSG_H08 202200 Bachelor of Engineering (Honours) in Advanced Manufacturing Systems
GA_EADMG_L08 202200 Higher Diploma in Engineering in Automation and Digital Manufacturing
GA_EADMG_H08 202200 Bachelor of Engineering (Honours) in Automation and Digital Manufacturing

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Atlantic Technological University

ENER08002 2022
Energy Management

Elective Delivered in Stage 4 Semester 7

Full Title	Energy Management		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Christoph Schellenberg		
Co Authors	Carine Gachon, Oliver Mulryan, Tom Roche, Michelle McGuinness		

Module Description

An introduction to the implementation of energy efficiency and energy management practices in buildings, industrial facilities and other organisations.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Explain and apply the fundamental areas of energy efficiency including thermal and electrical systems in industrial and building applications.
2.	In the context of the UN's Sustainable Development Goals (SDGs), discuss the drivers of energy efficiency and energy management including economic, environmental and policy considerations.
3.	Describe Energy Management principles and demonstrate the ability to plan energy audits, analyse the energy profile of an organisation and implement energy management systems such as ISO 50001.
4.	Evaluate energy efficiency and energy management projects through engineering economic analysis.

Indicative Syllabus

1. Energy
    1. Introduction to Energy (types and sources)
    2. Global and National Energy Demand Profiles
    3. Review of Thermal Science Fundamentals (thermodynamics, heat transfer, et)
2. Economic, Environmental and Political Drivers of Energy Management
    1. Energy Efficiency as a Competitive Advantage
    2. Climate change
    3. Air Pollution
    4. Resource Depletion
    5. Energy Security
    6. International Agreements
    7. National Policy
3. Energy Management Systems and Principles
    1. Introduction to Energy Management
    2. ISO50001
    3. Commonality with ISO14001 and ISO9001
4. Energy Audit and Energy Analysis
    1. Energy Audit
    2. Energy Use and Distribution
    3. Energy Bill Analysis
    4. Energy Measurements
    5. Energy Monitoring and Targeting
    6. Energy Conservation Opportunities
5. Economics of Energy Management
    1. Engineering Economics
    2. Time Value of Money
    3. Life Cycle Cost Analysis
    4. Payback Period Analysis

Teaching and Learning Strategy

The module is designed around problem-based and project-based learning. The lectures involve the formal presentation and interpretation of key aspects of the module material, which will cover the major aspects of the curriculum and provide the stimulus for further reading and research. The material presented in the lectures will form the basis for the practical work.

The practical work includes tutorials and projects. The tutorials are student-centred activities to facilitate problem-based learning that is focused on key aspects of the lectures. The project work gives the student the opportunity to gain an understanding of the practical application of the theory.

Assessment Strategy

The knowledge that the learner obtains from the module will be assessed via a combination of formative and summative assessments. The summative assessments include ongoing homework assignments (tutorials) and projects with immediate feedback to facilitate assessment for learning. The final exam seeks to measure what has been learned via summative assessment representing assessment of learning.

Repeat Assessment Strategies

A repeat exam will be available in that will cover the percentage of marks obtained in the first terminal exam. The marks obtained in the coursework throughout the year cannot be repeated via a repeat examination and thus will be carried forward from the previous attempt.

Additional Facilities

None

Indicative Coursework and Continuous Assessment:		**70 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Group Project	Project on EU and National Energy Policy, Legislation, Regulations and Standards for different Industry Sectors	25 %	TBA	2
Group Project	Project entailing the implementation of an Energy Management System (ISO 50001) in a range of Industry Sectors	25 %	TBA	3,4
Assessment	Assessment of selection, implementation and economic analysis of energy projects in a range of industrial environments.	20 %	TBA	1,2,3,4

End of Semester / Year Formal Exam:		**30 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam End of Term Exam	30 %	End of Term	1,2,3,4

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Tiered Classroom	1	Weekly
Practical	Laboratory	Engineering Laboratory	3	Weekly

Required Reading Book List

Kanoglu, M., Cengel, A., (2020). *Energy Efficiency and Management for Engineers*. McGraw-Hill Education.
ISBN 1260459098 ISBN-13 9781260459098

ISO, (2019). *ISO 50001.* . 1 Edition.. ISO.

Boyle, G., (2012). *Renewable Energy*. OUP Oxford.
ISBN 0199545332 ISBN-13 9780199545339

Literary Resources

Energy : management, supply and conservation / Dr. Clive Beggs , Imprint Oxford : Butterworth-Heinemann, [2002]

Renewable energy : its physics, engineering, use, environmental aspects, economy and planning aspects / Bent Sørensen Imprint San Diego ; London : Academic, [2000]

Renewable energy / edited by Godfrey Boyle, Imprint Oxford : Oxford University in association with Open University, [2004]

Building energy management systems : applications to low-energy HVAC and natural ventilation control / G. J. Levermore Imprint London : E & F N Spon, 2000

Energy Management Standard IS393

Journal Resources

The Paris Agreement: A New Beginning, Journal for European Environmental & Planning Law 13 (2016) 3-29, Charlotte Streck, Paul Keenlyside, Moritz von Unger

Online Resources

http://learnonline.gmit.ie

https://www.carbontrust.com/

https://www.seai.ie/

https://www.gov.ie/en/

https://ec.europa.eu/energy/home_en

https://www.sgs.com/~/media/Global/Documents/White%20Papers/sgs-energy-management-whitepaper-en-11.ashx

https://www.dccae.gov.ie

https://www.britannica.com/event/Kyoto-Protocol

https://www.carbontrust.com/our-clients/?show=case-studies https://www.bsigroup.com/globalassets/localfiles/en-gb/iso-50001/resources/iso-50001-implementation-guide-web.pdf

https://www.carbontrust.com/our-clients/?show=case-studies

Programme Membership

GA_EMEAG_H08 202200 Bachelor of Engineering (Honours) in Mechanical Engineering
GA_EENAG_H08 202200 Bachelor of Engineering (Honours) in Energy Engineering
GA_EMEDG_H08 202200 Bachelor of Engineering (Honours) in Manufacturing Engineering Design

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ENVI08011 2023
Energy and Utilities Management

Elective Delivered in Stage 4 Semester 7

Full Title	Energy and Utilities Management		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	David Mulligan		
Co Authors	Carine Gachon, Jade Lyons		

Module Description

This Module includes: Climate Change and associated challenges for sustainability, energy management and standards. Specific topics covered include; Climate Change & Green House Gases, Sustainability and Renewable Energy, Irish Energy Structure, EU/national targets, ISO 50001, SEAI programme in Ireland in terms of Energy Management, Energy Efficiency, , Environment Management /GHG/EPA.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Describe sustainability challenges from Engineering perspective (GHS, fossil fuel dependency trends, Energy Balance)
2.	Describe key features of energy trading including wholesale and retail tariffs for gas and electricity.
3.	Solve/analyse using M&V report of monitoring and verification based on IPMVP internal protocol
4.	Develop understanding of new/emerging smart energy technologies - emphasis on smart grids and renewables/EVs.
5.	Understand ISO 50001 and the structured approach to managing energy (Energy MAP approach).
6.	have a strong and soundly technical appreciation of environmental management including role of EPA as statuary body Waste Management/Industrial Emissions Directive licensing from EPA.

Indicative Syllabus

- Management principles of energy/utilities.
- EU and Ireland targets and performance including Fuel Mix, Energy Efficiency and Renewable Energy (Wind/Hydro/tidal/wave/solar)
- Energy Balance (Energy Input/Output at national level and by sector/use e.g. transport, thermal, electricity)
- Renewable Energy utilisation and developments on onshore/offshore wind industry.
- Ireland dependency on fossil fuels.
- M&V standard for monitoring and adjustment/check for independent variable correlation (testing for linear regression)
- Structured approach to Energy Management including Energy MAP, ISO 50001 Energy Management standard
- Emerging technologies/Smart Grids.
- Wholesale Pool trading and understanding industrial gas/electricity tariffs
- Environmental and Waste management legislation for compliance including EPA Waste Permits/IED licencing for industrial sites.

Teaching and Learning Strategy

Weekly lectures coupled with assignment on energy operations.

Assessment Strategy

The assessment includes both final written exam and industry based assignments looking at sustainable energy with emphasis on Renewable, Energy Efficiency technologies and Carbon management/assessment.

Repeat Assessment Strategies

Repeat Exam and Assessment

Indicative Coursework and Continuous Assessment:	**30 %**

Form	*Title*	*Percent*	*Week (Indicative)*	*Learning Outcomes*
Assignment	Assignment	30 %	Week 7	1,2,3,4,5,6

End of Semester / Year Formal Exam:		**70 %**		
Form	*Title*	*Percent*	*Week (Indicative)*	*Learning Outcomes*
Closed Book Exam	Exam	70 %	End of Semester	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	*Description*	*Location*	*Hours*	*Frequency*
Lecture	Lecture	Lecture Theatre	2	Weekly
Tutorial	Tutorial	Flat Classroom	2	Weekly

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP08100 2023
Green Data Centre Design

Elective Delivered in Stage 4 Semester 7

Full Title	Green Data Centre Design		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The student will learn how to measure and monitor what impacts power management and metrics within a data centre as well as characterising the performance of various energy markets.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Critically evaluate the fundamentals and objectives of energy markets and their development.
2.	Develop, discuss and evaluate the variety of architectures which have been applied to energy markets.
3.	Evaluate the characteristics and performance of energy markets.
4.	Describe, analyse and evaluate various aspects of energy from an European and International prospective.

Indicative Syllabus

1. Introduction & Overview

- Data Centre fundamentals
- Issues and drivers

2. IT Infrastructure Resource Management

- Data Security (logical and physical)
- Data replication
- Server, storage and network resource management

3. Servers

- Physical, virtual and software
- Server fundamentals
- Measuring and comparing performance
- Virtual servers

4. Data Centre Implementation

- Best practices
- Consolidation, cloud development and deployment
- Energy efficiency
- Costing considerations in relation to the data centre environment
- Cost savings potential form improved energy consumption

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of green data centre design concepts and techniques. Students will work on real-world projects throughout the course, gaining hands-on experience in designing and implementing green data centres. This practical experience will help students develop their data centre design skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 40% Coursework and 60% End of Semester Final Exam.

Coursework may comprise a mix of assessment approaches, such as: reports, practicals, presentations, portfolios, class test, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

End of Semester Final Examination

The final written examination will be 2 hours in duration. It will comprise 5 questions of which the learner should attempt 3 questions.

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**40 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	40 %	Week 13	1,2,3

End of Semester / Year Formal Exam:		**60 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	60 %	End of Semester	1,2,3,4

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lectures	Not Specified	1	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learning	Not Specified	5	Weekly

Required Reading Book List

Schulz, G., (2009). *The Green and Virtual Data Center*. Auerbach Publications.
ISBN 1420086669 ISBN-13 9781420086669

Alger, D., (2010). *Grow a Greener Data Center*. Pearson Education.
ISBN 9781587058134 ISBN-13 1587058138

Arregoces, M., Portolani, M., (2003). *Data Center Fundamentals*. Cisco Press.
ISBN 1587050234 ISBN-13 9781587050237

Alger, D., (2005). *Building and Managing a Successful Data Center Facility*.
ISBN 1587051826 ISBN-13 9781587051821

Other Resources

http://www.dimensiondata.com/Lists/Downloadable%20Content/SevenDesignConsiderationsForAGreenDataC entreOpinionPiecepdf_129494767789944341.pdf

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

COMP08099 2023
Cloud Planning & Design

Elective Delivered in Stage 4 Semester 7

Full Title	Cloud Planning & Design		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 1	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

The student will develop key skills in policies and security issues related to cloud system implementations.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Analyse the required levels of service critical to supporting a cloud environment.
2.	Evaluate physical resources to migrate into the cloud environment, and new resource investment requirements.
3.	Describe and document a cloud design through service design, operations definitions and business planning.
4.	Evaluate and discuss internal infrastructures to ensure security and performance levels are adequate to meet potential project objectives through the development and deployment of an application.

Indicative Syllabus

1. Introduction & Overview

- Hardware, platforms, software
- Integration, business process

2. Infrastructure

- Planning & Design considerations
- Monitoring, backup/recovery procedures
- Environment planning

3. Scalability Concepts

- Scalability, Performance
- Session management, data replications and security

4. Application Development & Deployment

- End-to-end lifecycle, test environment
- Managing applications, automated functional test
- Planning checklists, web services, migration planning

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of cloud planning and design concepts and techniques. Students will work on real-world projects throughout the course, gaining hands-on experience in planning and designing cloud-based solutions. This practical experience will help students develop their cloud planning and design skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 40% Coursework and 60% End of Semester Final Exam.

Coursework may comprise a mix of assessment approaches, such as: reports, practicals, presentations, portfolios, class test, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

End of Semester Final Examination

The final written examination will be 2 hours in duration. It will comprise 5 questions of which the learner should attempt 3 questions.

Repeat Assessment Strategies
Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		40 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	40 %	Week 13	3,4

End of Semester / Year Formal Exam:		60 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	60 %	End of Year	1,2,3,4

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Not Specified	1	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learing	Not Specified	5	Weekly

Required Reading Book List
Ticknor, M., Corcoran, A., Csepregi-Horvath, B., Goering, A., Hernandez, J., Limodin, J., Pinto, S., Redbooks, I., (2011). *IBM WebSphere Application Server V8 Concepts, Planning, and Design Guide*. IBM Redbooks. ISBN 9780738435909 ISBN-13 0738435902
Chao, L., (2012). *Cloud Computing for Teaching and Learning*. ISBN 1466609575 ISBN-13 9781466609570
Moyer, M., (2011). *Building Applications in the Cloud*. Addison-Wesley Professional. ISBN 0321720202 ISBN-13 9780321720207

Other Resources
IEEE Database http://nexus.realtimepublishers.com/dgcc.php http://go.bmc.com/forms/WBNR_ESM_BuildOptmCloudEMA_BMCcom_EN_Dec2011

Programme Membership

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Atlantic Technological University

ELEC08061 2022
System Integration

Elective Delivered in Stage 4 Semester 8

Full Title	System Integration		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Electronic & Electrical Eng		
Module Author	Carine Gachon		

Module Description

This module will look at the data architecture of a manufacturing plant from manufacturing floor up to ERP level in accordance with the ISA-95. Students will learn how to assess an existing data architecture and plan for a new one taking into account validation requirements. On a practical level students will build a SCADA system integrating data from various equipments.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Assess the existing data architecture of a manufacturing plant and its components.
2.	Design specification for a data architecture based on user requirements considering sustainable development goals.
3.	Plan horizontal and vertical integration of a data architecture in a manufacturing system.
4.	Develop a data management system at SCADA level.
5.	Develop an integration plan considering validation.

Indicative Syllabus

Digital Maturity Assessment - 1 hr lecture

Digitalisation and sustainable Development Goals- 1hr

Vertical integration

•ISA-95, ISO 62264, B2MML - Overview (1hr lecture)

•ERP -Understanding the role of the ERP. (1 hr lecture)

•SDADA and Manufacturing Execution systems- Understanding their role and development of a SCADA/MES system. (20 hr practical-see below)

•Data models- batch system, recipe management system, machine performance data (OEE), process monitoring parameters,…

•Data interface, API, OPC and OPC UA

•Validation- Computer Software Assurance - GAMP5- Vmodel (2 hr lecture)

Horizontal integration

•Legacy equipment assessment–(hardware and communication system, code review assessment for data compatibility, Integration with new equipment,cost of return of upgrading the equipment) - (2hr lecture)

•New Equipment procurement-(Compability and return on investment) - (2hr lecture)

•Integration and compatibility- (2hr lecture)

Skill Gap Analysis - (1hr lecture)

Laboratory activities (20hr practical)

- Considerations and benefits of SCADA systems
- System reliability and availability
- Monitor and control of a PAC system
- The twelve golden rules for SCADA implementation
- Cyber security best practices.
- Data acquisition through industrial ethernet
- Alarm management through SCADA
- Automatic generation of reports for process performance evaluation

Teaching and Learning Strategy

This module will be delivered in a blended mode with 1 hr online lecture per week to cover the theory on data architecture and associated technologies. The practical

classes will concentrate on developing a SCADA system.

TL strategies used in this module include:

Direct-instruction strategy: e.g. online synchronous lectures;

Activity-based strategy: e.g. practice various techniques or prove concepts during practical activities; repeat an activity, review and feedback; individual projects; case studies

Cooperative strategy: e.g. facilitated group work to critically explore, formulate and communicate ideas, interpretations and conclusions;

ICT-based strategy: use of a virtual learning environment (Moodle) for interactive activities, information storage and assessment (quizzes); use software in class; use of various tools for feedback and formative assessment (e.g. Socrative, Padlet); use of Microsoft Teams for synchronous lectures delivery and for group work in breakout rooms

Independent learning strategy: e.g. directed study, flipped classroom

Critical thinking-skills strategy: e.g. problem-solving; creative thinking.

Assessment Strategy

The assessment strategy will include online quizzes, practical evaluations and a report where students will discuss aspects of the data architecture of their company and propose improvement.

Repeat Assessment Strategies

Students can resubmit their report and a practical repeat assessment will be offered.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Written Report/Essay	Data architecture analysis	30 %	End of Term	1,2,3,5
Multiple Choice/Short Answer Test	Online quizzes	20 %	OnGoing	1,2,3,5
Practical Evaluation	End of term practical assessment	20 %	End of Term	2,3,4
Practical Evaluation	Programming and Troubleshooting	30 %	OnGoing	2,3,4

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online lecture	Online	1	Weekly
Practical	Practical	Engineering Laboratory	2	Weekly

Blended Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Online lecture	Online	1	Weekly
Practical	Practical	Laboratory	2	Weekly

Required Reading Book List

Singh, J., (2015). *PLC And SCADA*.
ISBN 9351382427 ISBN-13 9789351382423

McCrady, G., (2013). *Designing SCADA Application Software*. Elsevier.
ISBN 9780124170353 ISBN-13 0124170358

Tupper, C., (2011). *Data Architecture*. Morgan Kaufmann Pub.
ISBN 0123851262 ISBN-13 9780123851260

, E., Kott, A., (2016). *Cyber-security of SCADA and Other Industrial Control Systems* . Springer.
ISBN 9783319321257 ISBN-13 3319321250

Rieger, C., Ray, I., Zhu, Q., Haney, A., (2019). *Industrial Control Systems Security and Resiliency* . Springer Nature.
ISBN 9783030182144 ISBN-13 3030182142

Ackerman, P., (2021). *Industrial Cybersecurity - Second Edition*. Packt Publishing.
ISBN 1800202091 ISBN-13 9781800202092

Programme Membership

GA_EADMG_L08 202200 Higher Diploma in Engineering in Automation and Digital Manufacturing
GA_EAMSG_H08 202200 Bachelor of Engineering (Honours) in Advanced Manufacturing Systems
GA_EADMG_H08 202200 Bachelor of Engineering (Honours) in Automation and Digital Manufacturing

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Atlantic Technological University

ELEC08065 2022
Digital Twin Technology

Elective Delivered in Stage 4 Semester 8

Full Title	Digital Twin Technology		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Carine Gachon		
Co Authors	Michelle McGuinness, Jack Saad		

Module Description

This module introduce the learner to Digital Twins, which are a virtual replica of the manufacturing process, and can, not only speed up the planning of a new product, but also support training, continuous improvement and maintenance planning when combined with IIoT and other technologies like AR and VR. Learners in the module will gain practical experience on building a digital twin and extracting data to support decision-making.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Appraise the benefits of adopting digital twin technologies when planning a new manufacturing process
2.	Discuss how Industrial Internet o Things (IIoT) and digital twin technology combine to give a live model of a manufacturing processes
3.	Investigate the use of Virtual Reality (VR) and Augmented Reality (AR) for the design, optimisation and planning of manufacturing processes
4.	Develop a 3D model of a manufacturing process

Indicative Syllabus

IIoT, Cyber physical systems and Digital Twins (1 hr lecture)

Manufacturing System modelling using digital twin software (1hr lecture and 4hr practical)

Simulation of manual operations using VR (1hr lecture and 3hr practical)

Manufacturing process simulation(1hr lecture and 4hr practical)

Optimisation of a manufacturing system at design phase (1hr lecture and 3hr practical)

Digital Twin for training using AR and VR (1hr lecture and 3hr practical)

Digital Twin Model actualisation using sensors and IoT (1hr lecture and 3hr practical)

Continuous improvement using the Digital Twin (1hr lecture and 3hr practical)

Predictive Maintenance using a Digital Twin (2hr lecture)

AR for maintenance (2hr)

Teaching and Learning Strategy

This module combines online learning and face to face laboratories where students will get support in building a 3D model of a manufacturing process and connecting it to the real world.

TL strategies used in this module include:

Direct-instruction strategy: e.g. online synchronous lectures;

Activity-based strategy: e.g. practice various techniques or prove concepts during practical activities; repeat an activity, review and feedback; individual projects; case studies

Cooperative strategy: e.g. facilitated group work to critically explore, formulate and communicate ideas, interpretations and conclusions;

ICT-based strategy: use of a virtual learning environment (Moodle) for interactive activities, information storage and assessment (quizzes); use software in class; use of various tools for feedback and formative assessment (e.g. Socrative, Padlet); use of Microsoft Teams for synchronous lectures delivery and for group work in breakout rooms

Independent learning strategy: e.g. directed study, flipped classroom

Critical thinking-skills strategy: e.g. problem-solving; creative thinking.

Assessment Strategy

The module will be assessed by a discussion essay on the benefits of IIoT and Digital Twins, lab work and a project.

Repeat Assessment Strategies

Students can resubmit all elements of the assessment strategy.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Essay	Discussion on the benefits of IIoT and digital twins	30 %	End of Term	1,2,3
Assignment	Practical Assignments	20 %	OnGoing	3,4
Project	Digital Twin project	50 %	End of Term	4

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online lecture	Online	1	Weekly
Practical	Digital Twin practical	Engineering Laboratory	2	Weekly

Blended Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Online lecture	Online	1	Weekly
Practical	Digital Twin practical	Laboratory	2	Weekly

Required Reading Book List

Misra, S., Roy, C., Mukherjee, A., (2020). *Introduction to Industrial Internet of Things and Industry 4.0* . CRC Press.
ISBN 036789758X ISBN-13 9780367897581

Machado, C., Davim, J., (2020). *Industry 4.0*. CRC Press.
ISBN 0815354401 ISBN-13 9780815354406

Chaudhary, G., Khari, M., Elhoseny, M., (2021). *Digital Twin Technology*. CRC Press.
ISBN 0367677954 ISBN-13 9780367677954

Online Resources

Michael Grieves - Google Scholar

Programme Membership

GA_EADMG_L08 202200 Higher Diploma in Engineering in Automation and Digital Manufacturing
GA_EAMSG_H08 202200 Bachelor of Engineering (Honours) in Advanced Manufacturing Systems
GA_EADMG_H08 202200 Bachelor of Engineering (Honours) in Automation and Digital Manufacturing

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Atlantic Technological University

ENGI08046 2022
Supply Chain Engineering

Elective Delivered in Stage 4 Semester 8

Full Title	Supply Chain Engineering		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	David Gorman		
Co Authors	Carine Gachon, Paul ODowd, Padraig Audley, Oliver Mulryan, Michelle McGuinness		

Module Description

The principles of sustainable Supply Chain Engineering. It will cover the design, management and control of the supply chain, from the market, sales and distribution, to manufacturing and procurement. Map a supply chain and describe mapping's role in Supply Chain design.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Identify the methodologies, roles, tools and impact of supply chain engineering
2.	Compare and contrast appropriate strategies and competitive behaviour for the supply chain.
3.	Apply appropriate supply chain improvement tools and techniques to optimise the green logistics system.
4.	Analyses the role logistic decisions make in designing a competitive supply chain.
5.	Design map and discuss how supply chain management supports the development and execution of a winning competitive strategy

Indicative Syllabus

- Understanding the Sustainable Supply Chain
- Supply Chain Drivers and Metrics
- Planning and Managing Inventories in the supply chain
- Demand Planning
- Procurement in the Supply Chain
- Order Management and Customer Relationship Management
- Supply Chain Management models, methods and strategies
- Material, Financial and Information flows within the chain
- Supply Chain Partners
- Supply chain mapping
- Core Competencies and Outsourcing
- Global Supply Chain Management
- Use of simulation to optimise supply chains
- Lean Supply Chains.
- Identify the risk and ethical considerations in designing sustainable supply chains

Teaching and Learning Strategy

The teaching and learning strategy used include :

- A direct instruction strategy (including lecture, repeating an activity, review and feedback)
- An activity based strategy (including practice)
- A cooperate teamwork strategy
- An ICT based strategy (including the use of a virtual learning environment: Moodle and specific software)
- An independent learning strategy (including homework and independent study)
- Thinking skills strategy (including problem solving, graphing)

This Modules combines face-to-face, online delivery either synchronous or asynchronous, and a high level of self-learning. Time allocation is given for the online delivery as well as support and monitoring of the learning.

Assessment Strategy

The module is assessed as follows;

70% final exam

15% of the overall mark is assigned to continuous assessment of theory.

A number of different assessment strategies will be used including: written assessments; assignments; group work; problem and scenario based exercises.

15% of the overall mark is assigned practical work.

A number of different assessment strategies will be used including: simulation; mapping, mini projects; practical lab work; group exercises; problem and scenario based exercises; specific software.

Repeat Assessment Strategies
A repeat exam will be offered

Indicative Coursework and Continuous Assessment:		**30 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	CA	30 %	OnGoing	1,2,3,4,5

End of Semester / Year Formal Exam:		**70 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Exam	70 %	End of Semester	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	2	Weekly
Practical	Lab	Computer Laboratory	2	Weekly

Required Reading Book List
Taha, A., (2016). *Operations Research*. Pearson. ISBN 0134444019 ISBN-13 9780134444017
Jay, B., (2011). *Operations Management*. ISBN 0135111439 ISBN-13 9780135111437
Handfield, B., (2014). *Introduction to Operations and Supply Chain Management* . Prentice Hall. ISBN 9780133871777 ISBN-13 0133871770
Myerson, A., (2015). *Supply Chain and Logistics Management Made Easy* . Pearson Education. ISBN 9780133993349 ISBN-13 0133993345

Literary Resources
Supply Chain Management: From Vision to Implementation 1/e. Fawcett, Ellram and Ogden, Pearson, 2010. Operations management, 10th Global Edition, Heizer and Render, Pearson, 2011. A Practical Guide to Transportation and Logistics, Michael B. Stroh. Logistics Network, 2001 World-class Warehousing and Material Handling (Logistics Management Library, Edward Frazelle. McGraw-Hill Education, 2001. Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service, Martin Christopher, Financial Times Prentice Hall, 2004.

Other Resources
Simulation Software

Programme Membership
GA_EMEDG_H08 202200 Bachelor of Engineering (Honours) in Manufacturing Engineering Design

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Atlantic Technological University

ELEC08067 2023
Advanced Manufacturing Systems

Mandatory Delivered in Stage 4 Semester 8

Full Title	Advanced Manufacturing Systems		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	17 Weeks - (17 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Philip Long		
Co Authors	Carine Gachon		

Module Description

This module will look at technologies that can support digitalisation of manufacturing, continuous improvement and faster time to market.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Investigate the use of additive manufacturing in the manufacturing industry.
2.	Select the appropriate technology for optimised traceability.
3.	Investigate the use of Automated Guided Vehicles (AGV), Autonomous Mobile Robots (AMR) and intelligent conveyors in process flow.
4.	Select and programme a Cobot for a given application.
5.	Investigate the role of emerging technologies in asset management and operational resilience.

Indicative Syllabus

Additive Manufacturing-

- Types and applications
- Topology optimisation (application and demo of software capabilities)
- File preparation (demo and practical on how to prepare a file)
- Set-up for optimal results (setting up parameters)

Product traceability

- Product ID and labelling (bar codes, data matrix codes, RFID tags applications)
- Tracking devices (Scanners, vision systems, smart glasses applications)

Material handling

- Automated Guided Vehicles (types, applications and limitations)
- Automated Mobile Robots (types, applications, limitations and programming of a mobile robots)
- Intelligent conveyors (technology and applications)
- Cobots (types, applications, limitations, and programming of a coot)

Asset Management and Operational Resilience

- Increasing availability (OEE)
- Predictive maintenance
- XR for training and assisted maintenance

Other emerging Technologies

Teaching and Learning Strategy

The module is delivered online with a mix of synchronous and asynchronous activities and uses a variety of teaching and learning pedagogies. Students develop and extend their knowledge and understanding of the topic through a balanced combination of:

Direct-instruction strategy: e.g. online synchronous lectures;

Activity-based strategy: e.g. practice various techniques or prove concepts during practical activities; repeat an activity, review and feedback; individual projects; case studies

Cooperative strategy: e.g. facilitated group work to critically explore, formulate and communicate ideas, interpretations and conclusions;

ICT-based strategy: use of a virtual learning environment (Moodle) for interactive activities, information storage and assessment (quizzes); use software in class; use of various tools for feedback and formative assessment (e.g. Socrative, Padlet); use of Microsoft Teams for synchronous lectures delivery and for group work in breakout rooms

Independent learning strategy: e.g. directed study, flipped classroom

Critical thinking-skills strategy: e.g. problem-solving; creative thinking.

Assessment Strategy

The module will be assessed through a combination online quizzes, practical evaluations and a report where students will analyse which technology is or should be used in their company to support continuous improvement.

Repeat Assessment Strategies

Students can re-submit their report and a repeat exam will be offered for the other 70% of the module.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Written Report/Essay	Continuous improvement project	30 %	End of Semester	1,2,3,4,5
Practical Evaluation	Lab assessments	50 %	OnGoing	2,3,4
Assessment	Online quizzes	20 %	OnGoing	1,2,3,4

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Online Learning	Online Lecture	Online	2	Weekly
Practical	Practical	Engineering Laboratory	2	Fortnightly

Blended Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Online lecture	Online	2	Weekly
Practical	Practical	Engineering Laboratory	2	Fortnightly

Required Reading Book List

Rttimann, B., (2017). *Lean Compendium*. Springer.
ISBN 9783319586014 ISBN-13 3319586017

Bandyopadhyay, A., Bose, S., (2019). *Additive Manufacturing, Second Edition*. CRC Press.
ISBN 9780429881022 ISBN-13 0429881029

Zhang, J., Jung, Y., (2018). *Additive Manufacturing: Materials, Processes, Quantifications and Applications*. Butterworth-Heinemann.
ISBN 9780128123270 ISBN-13 0128123273

Programme Membership

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

ENGI08020 2022
Plant Engineering

Elective Delivered in Stage 4 Semester 8

Full Title	Plant Engineering		
Status	Uploaded to Banner	**Start Term**	2022
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Willie Geraghty		
Co Authors	Carine Gachon, Oliver Mulryan, Michelle McGuinness		

Module Description

The aim of this module is to provide the students with an introduction to Industrial Plant Engineering relating to HVAC, Process Cooling, Clean Rooms, Compressed Air, Steam Plant, and Energy Efficient Design and Controls. The module will give the students the scientific and engineering knowledge to enable them to analyse and evaluate the application of these technologies, and design efficient solutions to specific engineering challenges.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Analyse the principles of refrigeration and process cooling, including Air cooled Chillers, DX Plant, Ammonia Chillers, Free Cooling Systems.
2.	Design energy efficient Cleanroom ventilation systems for ISO, GMP and FDA applications and calculate the ventilation requirements for various industrial and commercial applications, including CO2 Concentrations, VOCs, Air Change Rates, Temperature Control.
3.	Calculate the heating and cooling requirements for various applications based on weather data, sensible and latent heat gains.
4.	Describe the specific requirements for plant installations for Hospital applications.
5.	Design energy saving improvements for existing Compressed Air, Cleanroom, Air Conditioning, Boiler, Steam and Process Gas installations.

Indicative Syllabus

1. **Refrigeration Plant**

Water Cooled Chillers, Air Cooled Chillers, DX Plant, Ammonia Chillers, Free Cooling, Refrigeration Controls, Efficient Pumping and Hydronic Design

1. **Ventilation Requirements**

CO2 Concentration, VOCs, Properties of Moist Air and Psychrometrics, Demand Based Ventilation Strategies, Temperature, Humidity and Enthalpy control,

1. **Calculation of Heating and Cooling Loads**

Load Estimation, Weather Data, Load Minimisation, Fabric Design, Sensible and Latent loads – manually and by IES, Heat Recovery, Cooling Recovery,

1. **Industrial and Specialist Ventilation Systems**

Cleanroom systems and Design, ISO, GMP and FDA Classification. Displacement Ventilation, Healthcare Ventilation Systems, Process Extract Systems, Capture and Containment, Data Centres & Comms Rooms.

1. **Compressed Air and Process Gas Systems**

Compressor Types, Heat Recovery, Controls, Measurement, Leak minimisation. Efficiency Measures

1. **Instrumentation and Commissioning**

Building Management Systems, Non Invasive measuring equipment, Heat Meters, Variable Speed Drives, Flow Measurement, Pressure Measurement, Temperature Measurement, Humidity Measurement, Enthalpy Measurement. Discrete Controllers. KNX, Lonworks, BACnet.

Teaching and Learning Strategy

The module will be delivered using a combination of teaching and learning strategies including: lectures, tutorials, in class discussion and self-directed learning

Assessment Strategy

A blend of final written examination and continuous assessment projects and assessments.

Repeat Assessment Strategies
A written repeat Examination will be provided in Autumn.

Indicative Coursework and Continuous Assessment:		20 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Class Assessment Continuous Assessment	20 %	TBA	1,2

End of Semester / Year Formal Exam:		80 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam Exam	80 %	End of Term	1,2,3,4,5

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	2	Weekly
Practical	Computer Laboratory	Computer Laboratory	2	Weekly

Literary Resources
Hundy, G.F. and , Trott, T.C., Welch, T.C., (2008) *Refrigeration and Air-Conditioning*, 4th ed., London: Elsevier ISBN: 978-0-7506-8519-1 Hall, F., Greeno, R., (2009) *Building Services Handbook*, 5th ed., Oxford: Butterworth Heinmann, ISBN 13: 978-1-85617-626-2

Other Resources
None

Programme Membership
GA_EMEAG_H08 202200 Bachelor of Engineering (Honours) in Mechanical Engineering GA_EENAG_H08 202200 Bachelor of Engineering (Honours) in Energy Engineering

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Atlantic Technological University

ENVI08010 2023
Distributed Generation, System Design and Integration

Elective Delivered in Stage 4 Semester 8

Full Title	Distributed Generation, System Design and Integration		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	10
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	David Mulligan		
Co Authors	Carine Gachon		

Module Description

This module deals with the design of an integrated system from design through to integration and smart grid analysis.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Demonstrate an understanding of the main components of an electrical distribution network
2.	Evaluate and select the most appropriate components to be used in a distributed generation schemes and their application to electrical energy networks
3.	Evaluate the impact of distributed generation on a network performance
4.	Select and justify the main features of protection system used in the distribution networks with distributed generation
5.	Evaluate the technical and economic factors which should be taken into account when designing a distributed network extensions
6.	Design and model a distributed electrical network with distributed generation notes and evaluate its performance and efficiency.

Indicative Syllabus

1. Load Flow Analysis: Load flow analysis is a method used to calculate the steady-state operating conditions of an electrical power system. It involves solving a set of nonlinear equations to determine the voltage, current, and power flows in the network.
2. Voltage Regulation: Voltage regulation is the process of maintaining a constant voltage level within a power system. Voltage regulators are used to adjust the voltage levels at different points in the network to ensure that the voltage at the load remains within acceptable limits.
3. Fault Analysis: Fault analysis is the process of identifying and locating faults in a power system. Faults can cause power outages and damage to equipment. By identifying and locating faults quickly, power system operators can minimize the impact of the fault and restore power more quickly.
4. Energy Storage: Energy storage systems can be used to store excess energy generated during periods of low demand and release it during periods of high demand. This can help to reduce the need for additional generation capacity and improve the overall efficiency of the power system.
5. Power Quality Improvement: Power quality refers to the stability and reliability of the voltage and frequency in a power system. Power quality issues can cause equipment damage and affect the performance of sensitive electronic devices. Power quality improvement methods can be used to mitigate these issues, including the use of filters and voltage regulators.
6. Load Shedding: Load shedding is the process of shedding or disconnecting non-critical loads from the network during periods of high demand or when there is a shortage of power. This can help to prevent blackouts and ensure that critical loads remain powered.

Teaching and Learning Strategy

Online learning with practical modelling

Assessment Strategy

Exam and Labs

Repeat Assessment Strategies

Exam and resubmit assignment

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***

Assignment	Practical	50 %	OnGoing	1,2,3,4,5,6

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Exam	50 %	End of Semester	1,2,3,4,5,6

Full Time Delivery Mode:				
Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecture	Lecture Theatre	2	Weekly
Practical	Lab	Engineering Laboratory	3	Weekly

Programme Membership

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Atlantic Technological University

COMP08103 2023
Predictive Modelling

Elective Delivered in Stage 4 Semester 8

Full Title	Predictive Modelling		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

This module will expand upon the knowledge gained from the Data Analytics module. It will provide the learner with the skills required to gain an appreciation of the complexity of predictive model design and the steps required for the development of a data prediction model. Students will also gain an appreciation of the importance of data visualisation for improved decision making and information interpretation.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Identify and evaluate logistic regression models and their suitability for an assigned use case.
2.	Design a time series forecast model using previously identified datasets aligned with an assigned use case.
3.	Develop and document the procedures required to build a time series model.
4.	Plan and implement a time series model and evaluate its effectiveness and fit through relevant metrics.
5.	Develop and present data forecasts using appropriate visualisation tools.

Indicative Syllabus

1. **Regression analysis**
   - Generalised linear model
   - Logistic regression
   - Poisson regression
   - Multiple linear regression
   - Interpreting model parameters
2. **Time series**
   - Time series concepts
   - Time series objects
   - Data smoothing and exponential smoothing
   - Seasonal decomposition
   - Exponential forecast modelling
3. **Time series forecasting**
   - ARIMA forecasting models
   - Model fitting
   - Making forecasts
   - Automated ARIMA
   - Model evaluation
4. **Data visualisation**
   - Libraries and tools used for visualisation
   - Interactive charts and dashboards
   - Machine Learning and Artificial Intelligence

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of predictive modelling techniques and their application. Students will work on real-world projects throughout the course, gaining hands-on experience in building, evaluating, and refining predictive models using various techniques. This practical experience will help students develop their predictive modelling skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 100% Coursework.

Indicative Assessment

The assessments will serve to provide students with theoretical and practical familiarity of the implementation of various flavours of prediction systems. Learners will become aware of the techniques required to design and build a time series model. They will learn how to apply a time series model to datasets for data prediction, and to present their findings through data visualisation tools. A good grasp on data prediction processes and capabilities will be attained through practical activities.

Element No	Weighting	Type	Description	Learning Outcome Assessed
1	60%	Predictive modelling assignment	Each student will produce a predictive modelling assignment describing the reasoning behind their selected predictive model. They will describe the processes required to build, implement, validate and forecast their predictive model. The forecast model will be used for the data visualisation assignment.	1,2,3,4
2	40%	Data visualisation assignment	The student will use previously constructed predictive model and implement suitable visualisation tools to accurately present results.	5

Repeat Assessment Strategies

Repeat coursework.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	100 %	End of Semester	1,2,3,4,5

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lecturers	Not Specified	1	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learning	Not Specified	5	Weekly

Required Reading Book List

Ciaburro, G., (2018). *Regression Analysis with R*. Packt Publishing.
ISBN 178862730X ISBN-13 9781788627306

Shumway, H., Stoffer, S., (2017). *Time Series Analysis and Its Applications* . Springer.
ISBN 3319524518 ISBN-13 9783319524511

Brockwell, J., Davis, A., (2016). *Introduction to Time Series and Forecasting* . Springer.
ISBN 3319298526 ISBN-13 9783319298528

Other Resources

Data Science+ is an online community for R tutorials. https://datascienceplus.com/

CRAN packages for R programming language - https://cran.r-project.org/web/views/

R Studio resources - https://rstudio.com/

Jupyter notebook – installation guide for jupyter notebook with R - https://www.datacamp.com/community/blog/jupyter-notebook-r

Data Science Central contains lots of free R tutorials - https://www.datasciencecentral.com/profiles/blogs/100-free-tutorials-for-learning-r

Programme Membership

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COMP08105 2023
Data Analytics

Elective Delivered in Stage 4 Semester 8

Full Title	Data Analytics		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	05
Delivery Mode	Semester 2	**Duration**	Semester - (13 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

This module will examine data analysis strategies and methods and the importance of data and business intelligence to an organisation. It will introduce the use of a statistical programming language and the evaluation of methods required to pre-process, condition and extract data prior to evaluation. Furthermore, the learner will develop an understanding of how to select and implement data analytic techniques, generate insight and interpret data visualisations.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Identify suitable data sources for an assigned use case and evaluate pertinence of captured data.
2.	Manage datasets and evaluate content for pre-processing, conditioning and extraction.
3.	Apply data analytic techniques to derive insight and value from datasets.
4.	Understand the importance of data analytics in deriving insight for business intelligence.
5.	Critically appraise data analytics technologies and techniques across a broad range of use cases.
6.	Apply research, information gathering, critical analysis, design and implementation techniques appropriately and effectively.

Indicative Syllabus

1. Introduction
- IDE and environment configuration
- Data analytics in the real world
- Introduction to the statistical programming environments

2. Statistical programming
- Data types, vectors, matrices and dataframes
- Loops and functions
- Data ingestion and aggregation
- Packages and libraries
- Numerical methods for describing data

3. Datasets
- Creating a dataset
- Data capture and sources
- Correlation and causation
- Univariate and multivariate analysis
- Data interpretation and insight

4. Data Visualisation
- Data visualisation toolkits
- Exploration of data with purpose
- Data presentation and delivering insight and value
- Dashboards and visual storytelling

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of data analytics concepts and techniques. Students will work on real-world projects throughout the course, gaining hands-on experience in data analysis and visualization. This practical experience will help students develop their data analytics skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The assessment for this module will be 100% coursework. Coursework may comprise a mix of assessment approaches, such as: reports, practicals, class tests, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

Repeat Assessment Strategies

Repeat coursework

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Group Project	Case study: Impact and evolution data analytics and real world insight	40 %	OnGoing	1,3,5
Assessment	Statistical Programming Language understanding and use	25 %	OnGoing	1,2,3
Assessment	Data analytics challenge to produce data visualisation and derive insight	35 %	OnGoing	3,4,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lectures	Not Specified	1	Weekly
Tutorial	Tutorial	Not Specified	1	Weekly
Practical	Lab Practical	Computer Laboratory	2	Weekly
Independent Learning	Independent Learning	Not Specified	4	Weekly

Recommended Reading Book List

Provost, F., Fawcett, T., (2013). *Data Science for Business*. Oreilly & Associates Incorporated.
ISBN 1449361323 ISBN-13 9781449361327

James, G., Witten, D., Hastie, T., Tibshirani, R., (2014). *An Introduction to Statistical Learning* . Springer.
ISBN 1461471370 ISBN-13 9781461471370

Jones, B., (2014). *Communicating Data with Tableau*. Oreilly & Associates Incorporated.
ISBN 1449372023 ISBN-13 9781449372026

Ballard, C., Farrell, M., Gupta, A., Mazuela, C., Vohnik, S., Redbooks, I., (2012). *Dimensional Modeling: In a Business Intelligence Environment* . IBM Redbooks.
ISBN 9780738496443 ISBN-13 0738496448

Grus, J., (2019). *Data Science from Scratch*. O'Reilly Media.
ISBN 1492041130 ISBN-13 9781492041139

Monsey, M., Sochan, P., (2015). *Tableau For Dummies*. John Wiley & Sons.
ISBN 9781119134794 ISBN-13 111913479X

Inmon, WH., Linstedt, D., (2014). *Data Architecture: A Primer for the Data Scientist* . Morgan Kaufmann.
ISBN 9780128020913 ISBN-13 0128020911

van Buuren, S., (2018). *Flexible Imputation of Missing Data* . Chapman & Hall/CRC.
ISBN 1138588318 ISBN-13 9781138588318

Online Resources

Data Science+ is an online community for R tutorials. https://datascienceplus.com/
CRAN packages for R programming language - https://cran.r-project.org/web/views/
R Studio resources - https://rstudio.com/
Online learning resources with extensive Data Analytics content https://www.superdatascience.com & https://www.datacamp.com
Data Science Central contains lots of free R tutorials - https://www.datasciencecentral.com/profiles/blogs/100-free-tutorials-for-learning-r

Programme Membership

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Atlantic Technological University

COMP08101 2023
Management Operations in Green/Cloud Environments

Elective Delivered in Stage 4 Year Long

Full Title	Management Operations in Green/Cloud Environments		
Status	Pending Approval by School	**Start Term**	2023
NFQ Level	08	**ECTS Credits**	10
Delivery Mode	Year	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric/Percentage	**Failed Element**	No
Department	Mechanical & Industrial Eng		
Module Author	Jade Lyons		
Co Authors	Carine Gachon, Angela Noonan McGinley		

Module Description

To provide the student with a significant level of comprehension both of the theoretical concepts and practical issues regarding optimal management of green data centres and cloud systems.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Devise a strategy for the management of multi-tenant environments.
2.	Evaluate cloud management suites.
3.	Analyse and develop business process management services for the cloud infrastructure.
4.	Analyse the performance of a green server farm.
5.	Develop costing thresholds and cost optimisation plans.
6.	Produce a detail agenda for the certification (e.g.LEED) of a green data center.

Indicative Syllabus

1. Management Strategies

- Strategies for the management of multi-tenant environments
- Cloud Management Suites
- Green Data Centre Management Suites
- Optimisation of asset usage
- National, European & Worldwide strategies.
- High-availability strategies: redundancy, clustering, map-reduce.

2. Business Process Management Services

- Business Process Management Services for the cloud infrastructure
- Big Data Management
- QoS Management

3. Monitoring & Certification

- Performance monitoring of a Green Server farm.
- Performance monitoring of a Cloud System.
- Metrics: PUE, CUE, WUE, PAR4
- Virtual machine management based on resource usage
- Certification of Enterprise Systems, e.g. LEED, EnergyStar, OASIS, OVF, etc

4. Costing Techniques

- Establishing costing thresholds.
- Cost optimisation plans.
- Outsourcing cost analysis

Teaching and Learning Strategy

Lecturers will employ an active learning approach that encourages students to actively participate in their own learning process. This includes classroom discussions, group activities, and hands-on exercises that promote a deeper understanding of green cloud management concepts and techniques. Students will work on real-world projects throughout the course, gaining hands-on experience in managing green/cloud environments and implementing sustainable practices. This practical experience will help students develop their cloud management skills and apply the theoretical concepts learned in the course to real-life situations.

Assessment Strategy

The module will comprise 50% Coursework and 50% End of Semester Final Exam.

Coursework may comprise a mix of assessment approaches, such as: case studies, reports, practicals, presentations, portfolios, class tests, quizzes, group work and integrated assessment. Details of the nature of assessment and submission dates are contained in the annual Programme Assessment Schedule.

End of Semester Final Examination

The final written examination will be 3 hours in duration. It will normally comprise 6 questions of which the learner should attempt 4 questions.

Repeat Assessment Strategies

Repeat coursework and exam.

Indicative Coursework and Continuous Assessment:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	Continuous Assessment	50 %	End of Semester	1,2,3,4,5,6

End of Semester / Year Formal Exam:		**50 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Closed Book Exam	Final Exam	50 %	End of Semester	1,3,5,6

Full Time Delivery Mode:

Type	***Description***	***Location***	***Hours***	***Frequency***
Lecture	Lectures	Not Specified	1	Weekly
Practical	Lab/Studio/Practicals	Not Specified	2	Weekly
Independent Learning	Independent Learning	Not Specified	9	Weekly

Required Reading Book List

Kusnetzky, D., (2011). *Virtualization*. "O'Reilly Media, Inc.".
ISBN 9781449306458 ISBN-13 1449306454

Schulz, G., (2009). *The Green and Virtual Data Center*. Auerbach Publications.
ISBN 1420086669 ISBN-13 9781420086669

Sterling, D., Kumar, P., (2011). *Dancing on a Cloud*. Xlibris Corporation.
ISBN 1465393668 ISBN-13 9781465393661

Spafford, G., (2008). *The Governance of Green IT*. IT Governance Ltd.
ISBN 1905356749 ISBN-13 9781905356744

Other Resources

Cloud-Standards.org

IEEE Database

ACM Database

Webography:

http://java.sun.com/docs/books/tutorial/security/index.html http://java.sun.com/javase/7/docs/technotes/guides/security/index.htm

Programme Membership