

<b>Module Title:</b>	Network Programmability and Automation
<b>Language of Instruction:</b>	English
<b>Credits:</b>	5
<b>NFQ Level:</b>	7
<b>Module Delivered In</b>	<a href="#">5 programme(s)</a>
<b>Teaching &amp; Learning Strategies:</b>	Combination of lectures and practical laboratory sessions. Lectures will take the form of traditional theory and tutorials. Laboratory sessions take the form of individual & group work.
<b>Module Aim:</b>	To provide the student with: 1. the skills necessary to automate and program networks. 2. apply software-defined networking principles. 3. Apply DevOps principles to network management
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Relate how automation impacts network management and compare DevOps techniques to traditional techniques, such as SNMP and CLI
LO2	Identify characteristics of RESTful based APIs (CRUD, HTTP verbs, data encoding), interpret and manipulate JSON encoded data.
LO3	Classify and employ DevOps tools for IT automation.
LO4	Relate Cloud, Virtualisation and Containerisation as the foundation for Software-Defined Networking (SDN)
LO5	Build Controller-based Software-Defined Networks and compare to traditional networks.
<b>Pre-requisite learning</b>	
<b>Module Recommendations</b>	
<i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
<b>Incompatible Modules</b>	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b>	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
Python programming and GNU/Linux system administration	

## Module Content & Assessment

### Indicative Content

#### DevOps and network automation

How network automation impacts network management. Syntax, JavaScript Object Notation (JSON), Extensible Markup Language (XML), YAML Ain't Markup Language (YAML), Object representation, Key/Value pairs.

#### RESTful APIs

Client/server, Stateless, Cacheable. Uniform Resource Identifier (URI) representation, HTTP methods. Authentication. Create, Read, Update, Delete (CRUD) .

#### Configuration Management Tools

Ansible, Chef, Puppet, Python modules such as the Netmiko Library for SSH access, NETCONF.

#### Virtualisation and Containerisation

Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Virtual Machines, Containers, Hypervisor, Virtual Switches, Virtual Network Infrastructure (VNI)

#### Software-Defined Networking (SDN)

Data, Control, and Management Planes, SDN Controllers, North-Bound Interface (NBI), South-Bound Interface (SBI), OpenFlow, Mininet, Cisco Application Centric Infrastructure (ACI).

Assessment Breakdown	%
Continuous Assessment	40.00%
Project	20.00%
Practical	40.00%

### Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Multiple Choice Questions	MCQ 1: The students will be given an MCQ to assess their knowledge of DevOps, RESTful API and JSON.	1,2,3	20.00	n/a
Multiple Choice Questions	MCQ 2: The students will be given an MCQ to assess their knowledge of SDN and SDN programmability.	4,5	20.00	n/a

### Project

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	Each learner will receive a Scenario-based problem to solve and describe their solution via presentation and demonstration.	1,2,3,4,5	20.00	n/a

### Practical

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Two practical examinations to demonstrate the achievement of the learning outcomes.	1,2,3,4,5	40.00	n/a

No End of Module Formal Examination

### Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Multiple Choice Questions	MCQ 1: The students will be given an MCQ to assess their knowledge of DevOps, RESTful API and JSON.	1,2,3	20.00	n/a
Multiple Choice Questions	MCQ 2: The students will be given an MCQ to assess their knowledge of SDN and SDN programmability.	4,5	20.00	n/a

### Project

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	Each learner will receive a Scenario-based problem to solve and describe their solution via presentation and demonstration.	1,2,3,4,5	20.00	n/a

<b>Practical</b>				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Practical/Skills Evaluation	Two practical examinations to demonstrate the achievement of the learning outcomes.	1,2,3,4,5	40.00	n/a

No End of Module Formal Examination
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**SETU Carlow Campus reserves the right to alter the nature and timings of assessment**

**Module Workload**

<b>Workload: Full Time</b>		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Every Week	3.00
Laboratory	Every Week	2.00
Independent Learning Time	Every Week	5.00
Total Hours		10.00

**Module Delivered In**

Programme Code	Programme	Semester	Delivery
CW_EEBEE_B	<a href="#">Bachelor of Engineering (Honours) in Biomedical Electronics</a>	6	Elective
CW_EESYS_B	<a href="#">Bachelor of Engineering (Honours) in Electronic Engineering</a>	6	Elective
CW_EEROB_B	<a href="#">Bachelor of Engineering (Honours) in Robotics and Automated Systems</a>	6	Elective
CW_EEBEE_D	<a href="#">Bachelor of Engineering in Biomedical Electronics</a>	6	Mandatory
CW_EEROO_D	<a href="#">Bachelor of Engineering in Robotics and Automated Systems</a>	6	Mandatory