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MODULE DESCRIPTOR

Module Title

System Control, Monitoring and Maintenance

Reference	ENM285	Version	1
Created	August 2017	SCQF Level	SCQF 11
Approved	January 2018	SCQF Points	15
Amended		ECTS Points	7.5

Aims of Module

The aim of this module is to critically understand the process of monitoring and maintenance activities involved around operating solar PV and solar thermal systems. Students will learn in detail about signals synthesis, techniques used to predict complex processes and how these can be applied to monitor and maintain the PV and thermal systems effectively over their life span.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

1	Critically analyse the synthesis of signals from process variables in terms of their generation, processing, analysis and transmission.
2	Demonstrate significant understanding of PV and Solar thermal monitoring and maintenance.
3	Apply critical analysis techniques to predict dynamic processes over short and long terms.
4	Critically analyse the practices in Solar PV and Solar thermal Operation and evaluate usefulness of SMART and integrated control systems.
5	Apply extensive and detailed knowledge of sensors, transducers, actuators and control systems by designing an application to solve industrial problem.

Indicative Module Content

Overview of signal synthesis in terms of their generation, processing, analysis and transmission. Techniques to predict complex processes using concepts of data visualisation, simulation, localisation and analytical methods. Use strategies to predict weather, storm, wind, hurricanes, precipitation, pressure gradient and temperature. Climatology, Numerical Weather Prediction (NWP). Concept of SMART and Integrated Control systems. Sensors and actuators. Signal transmission, command and control units. Use of meteorological devices used in monitoring system: pyranometer, pyrheliometer, temperature sensors, etc. Testing and inspection methods for Solar Energy systems. Operation and Maintenance of Solar Energy systems.

Module Delivery

This module is delivered by means of lectures, tutorials and student-centred learning activities

Module Ref:	ENM285 v1

Indicative Student Workload	Full Time	Part Time
Contact Hours	50	50
Non-Contact Hours	100	100
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
Actual Placement hours for professional, statutory or regulatory body		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	40%	Outcomes Assessed:	5
Description:	Assignment				

Component 2

Type:	Examination	Weighting:	60%	Outcomes Assessed:	1, 2, 3, 4
Description:	Exams				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

In order to pass the module, students should achieve a mark of at least 40% in each component (which has a weighting of 30% or more) and an overall grade of D or greater. Non Submission for any assessment component will result in an overall grade of NS for the module.

Module Grade	Minimum Requirements to achieve Module Grade:
A	Greater than or equal to 70%
B	In the range 60% to 69%
C	In the range 55% to 59%
D	In the range 50% to 54%
E	In the range 40% to 49%
F	Less than 40%
NS	Non-submission of work by published deadline or non-attendance for examination

Module Requirements

Prerequisites for Module	Normally a UK honours degree, or equivalent, in Engineering or related discipline at class 2.2 or above and proficiency in English language for academic purposes (IELTS minimum score of 6.5 or equivalent).
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1. BHATTACHARYYA, S.S., DEPRETTERE, E.F., LEUPERS, R., and TAKALA, J., 2010. Handbook of Signal Processing Systems. Springer. ISBN 978-1-4419-6345-1
2. RICHARD, G. LYONS, D. and FUGAL, L.,2014. The Essential Guide to Digital Signal Processing. Pearson Education (US). ISBN: 9780133804423
3. VIGNOLA, F. MICHALSKY, J. and STOFFEL, T., 2017.Solar and Infrared Radiation Measurements. CRC Press. ISBN 9781138075528
4. KOMARNICKI, P. LOMBARDI, P. and STYCZYNSKI, Z., 2017. Electric Energy Storage Systems: Flexibility Options for Smart Grids. Springer. ISBN 978-3-662-53275-1
5. NEILL, S., STAPLETON, G., and MARTELL, C., 2017. Solar farms: the Earthcan expert guide to design and construction of utility-scale photovoltaic systems. Routledge