Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION

Module Title:	**Optical Microwave Technology**	**Level**:	6	**Credit Value**:	20

Module code:	ENG697	**Is this a new module?**	YES	**Code of module being replaced**:	

Cost Centre:	GAME	JACS3 **code**:	H644

Trimester(s) in which to be offered:	1, 2	**With effect from:**	Sept 2017

School:	Applied Science, Computing & Engineering	**Module Leader:**	Dr A. Osanlou

Scheduled learning and teaching hours	60 hrs
Guided independent study	140hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BEng (Hons) Optoelectronics and Holography	✓	☐
BEng (Hons) Aerospace and Modern Optics	✓	☐

Pre-requisites
None

Office use only
Initial approval February 17
APSC approval of modification Version 1
Have any derogations received Academic Board approval? Yes ✓ No ☐

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Module Aims
The student will be provided with the fundamentals of optical technologies and microwaves. The student will be introduced to: i. Recent developments in the subject area, and real-life applications within which the technical work must fit, and ii. Photonics computer based methodologies which are state-of-the art and of industrial standard

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Able to comprehensively evaluate and communicate simulated and emulated technical test results, analysis and calculations in a professional manner	KS1	KS4
		KS5	
2	Able to advise practical operating solutions to relevant optical and microwave problems, integrating appropriate theoretical and practical methods, simulate performance, and test results	KS3	
		KS6	
3	Demonstrate an in-depth knowledge of optical and microwave principles and electromagnetic waves free space propagation	KS3	KS6
4	Critically analyse and evaluate integrated optic components, light sources and applications	KS3	KS6
5	Apply computer aided design, modelling, simulation, analysis and modification to complex Optical & Microwave problems	KS1	KS3
		KS6	

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

Assessment One
A 2-hour written examination that will review the students understanding of the subject area, covering learning outcomes 3 and 4.

Assessment Two
An optical communication based assignment of the students' choosing, to be agreed with their module leader.

As a group member, individuals will:

- create a single set of individual objectives and a plan of their individual responsibility as part of the group activities.
- create a portfolio producing their individual evidence activities, including elements of design, modelling and simulation of key concepts within an optical communication system.

The group will produce a single set of objectives for the whole group. This must be done for an intermediate group viva, where individual students will explain and justify their project approach. The group is expected to submit progress reports on a regular basis.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	3,4	Examination	50	2 hours	N/A
2	1,2,5	Portfolio	50		4000

Learning and Teaching Strategies:

The student will be taught through a series of lectures, tutorials, practical and supervised individual and group computer based investigations. Access is provided to industrial software, on-line learning materials and the university's Virtual Learning Environment (VLE)

Syllabus outline:

Optical and Microwave Fundamentals:
Electromagnetic waves: free space propagation
Interference
Coherence
Polarisation
Refraction
Reflection
Diffraction

Integrated Optic Components:
Waveguides
Modulators
Polarisers
Filters
Losses in Devices

Light Sources and Drains:
Semiconductor sources
Light emitting diodes
Semiconductor lasers
Organic lasers
Semiconductor light drains
Photodiodes

Optical Transmitter/ Receiver Circuit Design:
Optical transmitter design
Optical receiver design
Receiver circuit concepts
Noise in receivers

Applications:
Optical and microwave systems used in the cockpit of advanced vehicles
Hybrid Networks in Transportation Systems
Radar for Transportation Systems

Laboratory Practical Key Concepts:
Laser sources
Modulators and Modulation Formats
Fibres
Direct & Coherent Detection Receivers
WDM Systems
Switches

Bibliography:

Essential reading

Strobel, O. (2016), Optical and Microwave technologies for Telecommunication Networks, Chichester: John Wiley &Sons Ltd.

Other indicative reading

Zhou, X. and Xie, C. (2016), Enabling Technologies for High Spectral-Efficiency Coherent Optical Communication Networks.New Jersey: John Wiley &Sons Ltd.

Chrostowski, L., Hochberg, M. (2015), Silicon Photonics Design: From Devices to Systems. Cambridge, UK, Cambridge University Press.

Castaner, L. (2015), Understanding MEMS: Principles and Applications, Chichester: John Wiley &Sons Ltd.

Additional Key Website Reading:

http://www.ieee.org/index.html (Online resources from the IEEE)
IEEE Xplore Digital Library http://ieeexplore.ieee.org/Xplore/guesthome.jsp
IEEE, Monthly Journal;

Glydwr University Research CentreforAppliedScienceComputingandEngineering:
https://www.glyndwr.ac.uk/en/OurResearch/Researchcentres/UniversityResearchCentreforAppliedScienceComputingandEngineering/centre%20for%20ultra-realistic%20imaging/FurtherReading/

Online resources from the IET:
http://www.theiet.org/
IET, Monthly Journal.