



## MODULE DESCRIPTION FORM

### DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

### ME956 PAYLOADS

<b>Module Registrar:</b> Dr Suki Dauda Sule <a href="mailto:suki.sule@strath.ac.uk">suki.sule@strath.ac.uk</a>	<b>Taught To (Course):</b> MSc Satellite Applications (with Data Science)		
<b>Other Lecturers Involved:</b> Astrid Werkmeister, Prof Malcolm Macdonald	<b>Credit Weighting:</b> 10	<b>Semester:</b> 2	
<b>Assumed Prerequisites:</b> Introduction to Space Technologies	<b>Compulsory class</b>	<b>Academic Level:</b> 5	<b>Suitable for Exchange:</b> N

#### Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	Total
22	10						24	44	100

#### Educational Aim

This module aims to provide students with an understanding of the operation of satellite payloads used to provide satellite applications featuring an overview of payload fundamentals and types of sensors, along with the techniques to undertake a basic technical analysis of satellite payload systems or sensors.

#### Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Demonstrate an advanced working knowledge and understanding of the operation and major design elements of satellite payloads as well as gain an in-depth knowledge of the major types of payload sensors and how they function or operate.

LO2 Gain a fundamental understanding of radar systems in general and advanced knowledge of synthetic aperture radar (SAR) satellite payloads required to undertake SAR mission designs and analysis.

#### Syllabus

The module will teach the following:

- An overview of satellite payloads: types and design
- Passive sensors: overview of panchromatic, multispectral sensors, hyperspectral sensors
- Active sensors: overview of microwave active sensors, light active sensors
- Radar principles: fundamentals and principles of operation
- Synthetic aperture radar (SAR): fundamentals and principles of operation
- An overview of communications, GNSS and remote sensing payloads
- An overview of future satellite applications payloads
- Other payloads systems: terrestrial communication systems and user terminals ( machine to machine, satellite automatic identification systems, automatic dependent surveillance broadcast)

## Assessment of Learning Outcomes

### Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1 Demonstrate an advanced understanding of the operation and major design elements of satellite payloads as well as gain an in-depth knowledge of the major types of payload sensors and how they function or operate.

C1 Demonstrate correct identification and knowledge of elements of satellite payload design for different applications

C2 Distinguish different types of sensors and the satellite applications that utilise them

LO2 Gain a fundamental understanding of radar systems in general and advanced knowledge of synthetic aperture radar (SAR) satellite payloads required to undertake SAR mission designs and analysis.

C1 Demonstrate an understanding of how SAR payloads could be used for different satellite applications

C2 Demonstrate the ability to develop a high level SAR satellite applications mission design

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

### Principles of Assessment and Feedback

(within Assessment and Feedback Policy at: <https://www.strath.ac.uk/staff/policies/academic/> )

Please state briefly how these are incorporated in this module.

Assessment of student performance within the module will be based on a combination of written coursework assessment and written examination. The coursework assessment will be used to gauge the student's general understanding of the fundamentals of satellite payload design for satellite applications and types of active and passive sensors. The examination will primarily assess the student's in-depth understanding of the operation of different types of active and passive sensors, radar and SAR principles, other terrestrial satellite applications systems, and the ability to apply techniques introduced in class to basic satellite application payload design problems.

Multiple feedback mechanisms will be employed. Any written assessments will be returned to students with comments on performance. Additionally, clear guidance will be provided in class as to what constitutes an acceptable level of performance in written or online assessments. A class discussion and tutorial class will be used to provide further feedback on written/online assessments to the students in general and individually.

The tutorial class will also be used to provide feedback on the development of a student's technical analysis skills. This will be achieved through direct observation a student's efforts to tackle technical problems followed by appropriate mentoring. Furthermore, peer-to-peer feedback will be employed in that students will be expected to present to their peers on how they set about tackling a tutorial problem.

### Assessment Method(s) Including Percentage Breakdown and Duration of Exams

Examination				Coursework		Practical		Project	
Number	Month(s)	Duration	<b>Weighting</b>	Number	<b>Weighting</b>	Number	<b>Weighting</b>	Number	<b>Weighting</b>
1	Apr/May	2 hours	60%	1	40%				
* LO1, LO2				* LO1		*		*	

\* **L/Os:** Indicate which Learning Outcomes (LO1, LO2, etc) are to be assessed by exam/coursework/practical/project as required.

### Coursework / Submissions deadlines (**academic weeks**):

Coursework submission to Myplace week 8, Monday at 10pm

### Resit Assessment Procedures:

2 hr examination in August

### PLEASE NOTE:

Students must gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-assessed during the August diet. This re-assessment will consist entirely of exam. No marks from any previous attempts will be transferred to a new resit attempt.

## Recommended Reading

**\*\*\*Purchase recommended    \*\*Highly recommended reading    \*For reference (do NOT purchase)**

\*\* Macdonald M. (Editor), Badescu V. (Editor) (2014), The International Handbook of Space Technology, Springer, Heidelberg.

\* Skolnik MI (2008), Radar Handbook, Third Edition, McGraw-Hill, New York

\* Fitch PJ (2012), Synthetic Aperture Radar, Springer, New York

\* ESA Business Applications Newcomers Earth Observation Guide <https://business.esa.int/newcomers-earth-observation-guide>

## Additional Student Feedback

Date	Time	Room No
By arrangement	By arrangement	JW813

Session: 2019/2020

## Approved:

**Course Director Signature:** *E Henderson*

**Date of Last Modifications:** 27/08/2019

## MODULE TIMETABLE

Module Code:

ME956

Module Title:

Payloads

### Brief Description of Assessment:

Written coursework on satellite payload design, active and passive sensors (40% of mark).  
Module Examination (60% of mark)

### Assessment Timing:-

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.

**Please note: Timings can and will change, this should only be used as a guide.**

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.

Semester	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Set	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.