Module Specification

Radio Frequency and Microwaves Circuit Design

Version: 2023-24, v2.0, 10 Jul 2023

Contents

Part 1: Information

Module title: Radio Frequency and Microwaves Circuit Design

Module code: UFMFJN-15-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Mathematics for Signals and Control 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: This module is designed to introduce Radio Frequency (RF) and microwave design theory, techniques and measurements. It gives an overview of the fundamental concepts involved with RF/Microwave design and presents design methodologies for both passive and active RF and microwave circuits and antenna

design. Common and also detailed RF/Microwave measurements will be studied. Students will use an industry standard CAD package to gain an understanding of the role of CAD in RF and microwave circuit design.

In addition, the educational experience may develop through practice but not formally discretely assess self-management skills and working with others.

Outline syllabus: The syllabus outline includes:

Transmission line: Circuit analysis, linear and non-linear analysis, the use of optimisation and its limitations, evaluation of circuit sensitivity and yield analysis. Noise, gain and stability circle generation.

Microwave Circuits: Basic Superhetrodyne receiver. Discussion of block diagram components as used in practical communications systems.

Microwave Transmission Lines: Characteristic impedance and phase velocity of micro strip. Qualitative description of suspended substrate, micro strip, coplanar waveguide and fin-line.

S Parameters: Theory of two-port scattering matrix and relationship to measured performance of microwave networks.

Impedance charts: Theory of Smith Chart. Use of Smith Chart for matching networks.

General Microwave Circuits: Review of filters, mixers and oscillators. Discussion of phase noise and systems aspects of non-linearity.

Part 3: Teaching and learning methods

Teaching and learning methods: See educational aims and assessment.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Apply concepts underlying the design of RF and microwave circuits

MO2 Apply engineering and scientific principles of other disciplines to support real-world implementation of RF circuits design

MO3 Identify, compare and describe the performance of microwave systems

MO4 Evaluate performance of transmission lines using simulation software

MO5 Investigate constraints including ethical, health, safety, security and risk issues and code of practice and standards

MO6 Accurately present and interpret data

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/index.html

Part 4: Assessment

Assessment strategy: The assessment consists of an end of module examination and an individual assignment.

The strategy has been chosen to ensure that the RF and Microwaves engineering principles are assessed under controlled conditions, while a more open ended research based assignment is used to encourage wider engagement and reflection on this topic. In component B, the students will design a microwave communication circuit and will implement it by simulating using a given simulation package. The output from this group work activity will be a 3500 word group report with an

individual reflection.

Resit is the same as the first sit

Resit deliverable(s) will be scaled appropriately to group size and task complexity

Assessment tasks:

Examination (First Sit)
Description: Examination (2 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Report (First Sit)
Description: Group report with individual reflection (3500 words)
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5, MO6

Examination (Resit)
Description: Examination (2 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Report (Resit)
Description: Group report with individual reflection (3500 words)

Resit deliverable(s) will be scaled appropriately to group size and task complexity
Weighting: 50 %

Final assessment: No

Group work: Yes

Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Electronics and Telecommunication Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2020-21

Electronics and Telecommunication Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2020-21