Subject Description Form

Subject Code	EIE4119
Subject Title	Mobile Device System Architecture
Credit Value	3
Level	4
Pre-requisite	EIE3311 Computer System Fundamentals and EIE3331 Communication Fundamentals
Co-requisite/ Exclusion	Nil
Objectives	This course aims at providing students with an understanding of the hardware architecture and the techniques for the design and implementation of the computer and communication systems of mobile devices.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. Understand the hardware architecture and design constraints of mobile computers. 2. Understand the functions and features of different sub-systems of a mobile computer. 3. Understand the basic concepts of RF and wireless technologies used in mobile devices. 4. Analyse the performances of RF building blocks and subsystems with practical design parameters.
Subject Synopsis/ Indicative Syllabus	1. Essentials of Mobile Handset Design: Generations of mobile communication capability. Development of mobile handset. Basic functional blocks of mobile handset. 2. Mobile Computers and Their Applications: Mobile computers and their applications in daily life. Complex systems and microprocessors. The embedded system design process. Formalisms for system design. 3. Central Processing Units for Mobile Computers: Instruction set architecture, data operations, flow of control. Programming input and output. Memory system mechanisms. CPU performance. CPU power consumption. Case study: ARM processor. 5. Multiprocessors and co-processors: Why multiprocessors, CPUs and accelerators. Multiprocessor performance analysis. 3D graphics on embedded systems, principle of mobile 3D graphics system design, mobile 3D graphics APIs, real chip implementations. 6. Basic concept of RF and overview of mobile front-end system: frequency, bandwidth, wavelength, electromagnetic waves, electromagnetic spectrum, attenuation, power, decibels (dB) and transmission lines, overview of mobile front-end systems and its hardware architecture. 6 Basic component building blocks in mobile front-end system: Building blocks and components used in RF transmitters and receivers. Functionality and key technical characteristics. Introduction to active components such as power amplifier (PA), low noise amplifier (LNA), and passive components such as filters. 7. Linearity in mobile front-end systems: Effects of non-linearity in RF blocks and systems. Non-linear behaviour in AM-AM and AM-PM

conversion. Intermodulation distortion and spurious emission in RF transceiver systems.

Teaching/Learning Methodology

Method	**Remarks**
Lectures and quizzes	The subject matters will be delivered through lectures. Students will be engaged in the lectures through quizzes, discussions and specially designed classroom activities.
Tutorials	During tutorials, students will work on/discuss some chosen topics in small group. This will help strengthen the knowledge taught in lectures.
Laboratory and assignments	During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

Teaching/Learning Methodology	**Intended Subject Learning Outcomes**			
	1	**2**	**3**	**4**
Lectures and quizzes	✓	✓	✓	✓
Tutorials	✓	✓	✓	✓
Laboratory sessions		✓		✓

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**			
		1	**2**	**3**	**4**
1. Quizzes	5%	✓	✓	✓	✓
2. Tests	18%	✓	✓	✓	✓
3. Assignments	10%	✓	✓	✓	✓
4. Laboratory demonstration and reports	12%		✓		✓
5. Examination	55%	✓	✓	✓	✓
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Quizzes	Small exercises conducted to measure the students' basic understanding of the theories, concepts and the analysis methods taught during the lectures or tutorial classes.
Tests and examination	End-of chapter type problems used to evaluate students' understanding of the theories, concepts and the analysis methods taught in the subject. Their ability in applying them in solving problems will also be assessed.
Assignments	Examination type questions to measure the students' understanding of the theories, concepts and the analysis methods taught during the lectures or tutorial classes.
Laboratory sessions	During the laboratory sessions, students will be given some practical tasks so as to examine their understanding of the functions and features of different sub-systems of a mobile computer. They also require them to analyse the performances of RF building blocks and subsystems. Each student is required to produce a report on the laboratory work they conduct. Each student also needs to make a demonstration on the open-ended question set out in each laboratory work.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture/Tutorial	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Homework and self-study	66 Hours
	Total student study effort	**105 Hours**

Reading List and References

Reference Book:

1. Abhi Naha and Peter Whale, *Essential of Mobile Handset Design*, Cambridge University Press, 2012.
2. J. Hennessy and D. Patterson, *Computer Architecture – A Quantitative Approach*, 6th Edition, Morgan Kaufmann, 2017.
3. J.H. Woo, J.H. Sohn, B.G. Nam and H.J. Yoo, *Mobile 3D graphics SoC: From algorithm to chip*, John Wiley & Sons, 2010.
4. Behzad Razavi, *RF Microelectronics*, 2nd ed., Prentice Hall, 2014.
5. John Rogers, *Radio Frequency Integrated Circuit Design*, 2nd ed., Artech House, 2010.
6. David M. Pozar, *Microwave Engineering*, 4th ed., Wiley, 2011.

Last Updated	January 2019
Prepared by	Dr Daniel Lun