School of Microelectronics

Program of Microelectronic Science and Engineering for International Students (2021)

I. Introduction

The main objective of the School of Microelectronics is in the direction of integrated circuit chip design and manufacturing, and fosters innovative leading talents oriented to internationalization and industrialization. This discipline is a new engineering discipline developed on many basic disciplines. It is the pioneer and foundation of electronic science and information technology in the 21st century. It is also an important foundation for the development of modern high-tech and national economic modernization. Mainly researching the design and manufacturing technology of semiconductor devices and VLSI, and closely integrating with the industry. The School of Microelectronics will closely cooperate with the electronic engineering departments of famous universities in the Great Bay Area, as well as many leading enterprises in Shenzhen's local electronic information direction. Also will cooperate with the four research directions of EDA, VLSI-SoC, wide WBG semiconductor, and future communication. Therefore, the project is different from the existing microelectronics disciplines, and will further explore new engineering construction oriented by internationalization and industrialization.

II. Objectives and Learning Outcomes

The Microelectronic Science and Engineering major aims to provide students not only solid theoretical knowledge in semiconductor materials and devices, but also intends to the cultivate innovative leading talents capable of manufacturing and designing integrated circuit chips. The students can participate in microelectronics science and engineering courses offered by university teachers in Hong Kong and Macau at SUSTech, as well as internship courses. After graduating, the students can work in the design of electronic components manufacturing, integrated circuits and systems in various related enterprises, or they can continue their studies or research in famous universities in the Great Bay Area.

III. Study Length and Graduation Requirements

Study length: 4 years

Degree conferred: Bachelor of Engineering

The minimum credit requirement for graduation: 139 credits (not including English courses);

Category	Module	Minimum Credit Requirement
General Education (GE) Required Courses (52 credits)	Science	32
	Physical Education	4
	Chinese Languages & Culture	16
General Education (GE) Elective Courses (10 credits)	Humanities	4
	Social Sciences	4
	Arts	2
Major Course (77 credits)	Major Foundational Courses	24
	Major Core Courses	22
	Major Elective Courses	19
	Research Projects, Internship and Undergraduate Thesis / Projects	12
Total (not including English courses)		139

IV. Discipline

Major disciplines include Microelectronics Science and Engineering, integrated circuit Engineering .etc.

V. Main Courses

Fundamentals of Integrated Circuit, Fundamentals of Electric Circuits, Fundamentals of Integrated Circuit I- Analog Integrated Circuit, Fundamentals of Integrated Circuit II-Digital Integrated Circuit, Fundamentals of Microelectronics I-Semiconductor Material Physics, Fundamental of Microelectronics II -Semiconductor Device,Electromagnetic Field and Electromagnetic Wave,Signals and systems.

Frontier Seminars in Microelectronics and IC Designs I/II、Advanced Microelectronics Experiment I/II, VLSI Fabrication Technology, CMOS VLSI Design, CMOS Analog Integrated Circuit Design, Microprocessor Design, Fundamentals of Semiconductor Devices and Packaging, Introduction to GaN Semiconductor Materials and Devices.

VI. Practice-Based Courses

Core practical training includes Microelectronic related experiments, IC process internship, integrated circuit design internship, new engineering course innovation project experiment, Shenzhen industrialization company internship, as well as various academic competitions, such as the National IC Design Competition.

Major professional experiment includes Fundamentals of Integrated Circuit I- Analog Integrated Circuit, Fundamentals of Integrated Circuit II-Digital Integrated Circuit, Fundamental of Microelectronics II -Semiconductor Device, VLSI Fabrication Technology CMOS VLSI Design, CMOS Analog Integrated Circuit Design, Microprocessor Design.

VII. Pre-requisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of First Year	SME102	Fundamentals of Microelectronics and Integrated Circuit	
	EE104	Fundamentals of Electric Circuits	MA101B MA107B
	MA102B	Calculus II A	MA101B
	MA107A	Linear Algebra A	
	PHY105B	General Physics B (II)	PHY103B
	CS102B	Introduction to Computer Programming B	CS101B
	PHY104B	Experiments of Fundamental Physics	
Notes: At the end of First Year, In addition to the above courses, students must pass the interview.			
Declare major at the end of Second Year	SME102	Fundamentals of Microelectronics and Integrated Circuit	
	EE104	Fundamentals of Electric Circuits	MA101B MA107B
	MA102B	Calculus II A	MA101B
	MA107A	Linear Algebra A	
	PHY105B	General Physics B (II)	PHY103B
	CS102B	Introduction to Computer Programming B	CS101B
	PHY104B	Experiments of Fundamental Physics	
	SME201	Fundamentals of Integrated Circuit I - Analog Integrated Circuit	SME102
	SME202	Fundamentals of Integrated Circuit II -Digital Integrated Circuit	SME102
	SME203	Fundamentals of Microelectronics I -Semiconductor Material Physics	SME102
	SME204	Fundamental of Microelectronics II -Semiconductor Device	SME203
	SME205	Electromagnetic Field and Electromagnetic Wave	MA101B MA103A EE104
	EE205	Signals and systems	MA101B

VIII. Requirements for GE Required Courses

(I) Science Module

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Language Instruction	Prerequisite	Dept
MA101B	Calculus I A	4		4	Spr/Fall	B/E	NA	MATH
MA102B	Calculus II A	4		4	Spr/Fall	B/E	MA101B	MATH
MA107A	Linear Algebra A	4		4	Spr/Fall	B/E	NA	MATH
PHY103B	General Physics I B	4		4	Spr/Fall	B/E	NA	PHY
PHY105B	General Physics II B	4		4	Spr/Fall	B/E	PHY103B	PHY
PHY104B	Experiment for Foundation of Physics	2	2	4	Spr/Fall	B/E	NA	PHY
CH101B	General Chemistry B	3		3	Spr/Fall	B/E	NA	CH
BIO102B	Introduction to Life Science	4		4	Spr/Fall	B/E	NA	BIO
CS102B	Introduction to Programming B	3	1	4	Spr/Fall	B/E	NA	CSE
Total		**32**	**3**	**35**				

(II) Physical Education

Course Code	Course Name	Credits	Hours/week	Terms	Instruction language	Prerequisite	Dept.
GE131	Physical Education I	1	2	Fall	C	NA	
GE132	Physical Education II	1	2	Spr	C	NA	
GE231	Physical Education III	1	2	Fall	C	NA	
GE232	Physical Education IV	1	2	Spr	C	NA	PE Center
GE331	Physical Education V	0	2	Fall	C	NA	
GE332	Physical Education VI	0	2	Spr	C	NA	
Total		4	12				

GE131、GE132、GE231、GE232、GE331、GE332 are required PE courses offered by Center For Physical Education. Students are required to select a specific sport program each semester. Student who meets the exemption conditions stated in "SUSTech Physical Education Course Exemption Regulation" can apply for exemption from GE331 and GE332.

(III) Chinese Languages & Culture

Course Code	Course Name	Credit	Hours/week	Term	Language Instruction	Prerequisite	Dept
CLE008	Elementary Chinese I	2	4	1/Fall	B	NA	CLE
CLE009	Elementary Chinese II	2	4	1/Spr	B	CLE008	
CLE027	Intermediate Chinese I	2	4	2/Fall	B	CLE009	
CLE028	Intermediate Chinese II	2	4	2/Spr	B	CLE027	
CLE031	Advanced Chinese I	2	4	3/Fall	B	CLE028	
CLE032	Advanced Chinese II	2	4	3/Spr	B	CLE031	
CLE033	Chinese Culture	2	2	Spr/Fall	B/E	NA	CLE/ HUM/ SSC
CLE034	Chinese History	2	2	Spr/Fall	B/E	NA	

(IV) English Language

Students will undertake the English Placement Test and be placed into three levels according to the result of the test and their performance in the National College Entrance Exam. Students at different levels are required to take the courses with a different credit value in total.

Level A: 8 credits; SUSTech English III, English for Academic Purposes and 2-credit CLE elective course

Level B: 12 credits; SUSTech English II, SUSTech English III, English for Academic Purposes, and 2-credit CLE elective course

Level C: 14 credits; SUSTech English I, SUSTech English II, SUSTech English III, and English for Academic Purposes.

List of English Language Courses

Course Code	Course Name	Credit	Hours/week	Language Instruction	Prerequisite	Dept	Notes
CLE021	SUSTech English I	4	4	E	NA	CLE	Required
CLE022	SUSTech English II	4	4	E	CLE021		
CLE023	SUSTech English III	4	4	E	CLE022		
CLE030	English for Academic Purposes	2	2	E	CLE023		
/	(at least one 2-credit CLE elective course)	2	2	E	CLE030		Level A & B Required

IX Requirements for GE Elective Courses

Students are required to complete 4 credits for the Humanities Module and Social Sciences Module respectively, and 2 credits for the Music and Art Module. (Information about the available courses and the instruction language will be announced before the course selection session)

X. Major Course Arrangement

Table 1: Major Required Course (Foundational and Core Courses)

Course Category	Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	take the course Advised term to	Instruction language	Prerequisite	Dept.
Major Foundational Courses	SME102	Fundamentals of Microelectronics and Integrated Circuit	2		2	Spr	1/ Spr	B		SME
	EE104	Fundamentals of Electric Circuits	2		2	Spr/ Fall	1/Spr or Fall	B	MA101B MA107A or MA107B	EE
	SME201	Fundamentals of Integrated Circuit I- Analog Integrated Circuit	4	1	5	Spr/ Fall	2/Spr or Fall	B/E	SME102	SME
	SME202	Fundamentals of Integrated Circuit II -Digital Integrated Circuit	4	1	5	Spr/ Fall	2/Spr or Fall	B/E	SME102	SME
	SME203	Fundamentals of Microelectronics I-Semiconductor Material Physics	3		3	Spr/ Fall	2/Spr or Fall	B/E	SME102	SME
	SME204	Fundamental of Microelectronics II -Semiconductor Device	3	1	4	Spr/ Fall	2/Spr or Fall	B/E	SME203	SME
	SME205	Electromagnetic Field and Electromagnetic Wave	3	1	4	Spr/ Fall	2/Spr or Fall	B/E	MA101B MA103A EE104	SME
	EE205	Signals and systems	3	1	4	Fall	2/Fall	B	MA101B	EE
	Total		**24**	**5**	**29**					
Major Core Courses	SME301	Frontier Seminars in Microelectronics and IC Designs I	1		1	Spr/ Fall	2/Fall	B	NA	SME
	SME302	Frontier Seminars in Microelectronics and IC Designs II	1		1	Spr	2/Spr	B	NA	SME
	SME303	Advanced Microelectronics Experiment I	1	1	2	Fall	2/ Fall	B	NA	SME
	SME304	Advanced Microelectronics Experiment II	1	1	2	Spr	2/Spr	B	NA	SME
	SME305	VLSI Fabrication echnology	3	1	4	Fall	3/Fall	B	NA	SME
	SME306	CMOS VLSI Design	3	2	5	Spr	3/Spr	B	SME202 SME204	SME
	SME307	CMOS Analog Integrated Circuit Design	3	1	4	Fall	3/Fall	B	SME201 SME204	SME
	SME309	Microprocessor Design	3	1	4	Fall	3/Fall	B	SME202	SME
	SME319	Fundamentals of Semiconductor Devices and Packaging	3		3	Spr	3/Spr	B	SME204	SME
	SME321	Introduction to GaN Semiconductor Materials and Devices	3		3	Spr	3/Spr	B	SME203	SME
	Total		**22**	**7**	**29**					

Practice	SME470	Internship	2	2	4	smr	3/smr	C	NA	SME
	SME471	Summer Research	2	2	4	smr	3/smr	B	NA	SME
	SME480	Projects of Science and Technology Innovation	2	2	4	Spr &Fall	4/ Spr or Fall	B	NA	SME
	SME490	Thesis(Graduation Project)	8	8	8	Spr&Fall	4/Spr or Fall	B	NA	SME
		Total	**12**	**12**	**20**					

Note:
Students who have completed Comprehensive Design Ⅰ&Ⅱ(COE491&COE492) are not required to take the Graduation Projects/Thesis (SME490).
Choose either Internship （SME470）or Summer Research（SME471）to complete.

Table 2: Major Elective Courses

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Advised term to take the course	Instruction language	Prerequisite	Dept.
SME308	Advanced Semiconductor Fabrication Laboratory	3	1.5	4.5	Spr &Fall	3/Spr or Fall	B	SME204	SME
SME310	Deep learning on chip	3	1		Spr	3/Spr	B	SME202	SME
SME311	The Foundation of IC Layout Design	1	1		Spr	3/Spr	B	SME306 or SME307	SME
SME312	Electronic Design Automation (EDA) Basics	3	1	4	Spr	3/Spr	E	EE104 MA102B MA103A	SME
SME314	Biosensor Basics and DNA Sequencing Application	3		4	Spr	3/Spr	B	SME204or CH101B	SME
SME315	Design of Micro and Nano Sensors	3		4	Fall	3/Fall	B	PHY105B	SME
SME316	Design and Fabrication of Nano-electro-mechanical systems	3		3	Spr	3/Spr	B	SME204	SME
SME317	System-on-a-Chip Design	3	1	4	Fall	3/Fall	B	SME202	SME
SME323	Principle of Nano-optics	3		4	Fall	3/Fall	B		SME
SME325	Introduction to Power Electronics	3		4				SME201	SME
SME327	Introduction to Si Based Quantum Computing (QC) Devices	1		1	Fall	3/Fall	B	PHY206-15 or SME204	SME
SME401	Frontier Seminars in Microelectronics and IC Designs III	1		1	Fall	3/Fall	B	NA	SME
SME402	Frontier Seminars in Microelectronics and IC Designs IV	1		1	Spr	3/Spr	B	NA	SME
SME403	Advanced Microelectronics Experiment III	1	1	2	Spr	4/Fall	B	NA	SME
SME405	Advances in Micro Energy and Micro Sensing	2	1	2	Fall	3/Fall	B	NA	SME
SMES201	An Introduction of Machine Learning and EDA	2		2	Smr	2/Smr	E	NA	SME
SMES202	Patent Basics for Scientists and Engineers	1		1	Fall	2/Fall	B	NA	SME
SMES203	Fundamentals of Power IC Design	3		3	Smr	2/Smr	E	NA	SME
SMES204	Introduction to Nanoelectronics	2		2	Smr	2/Smr	E	NA	SME
SMES205	Fundamentals of Semiconductor Materials	2		2	Smr	2/Smr	E	NA	SME
SMES206	Selected Small Size Integrated Circuit Devices	1		1	Smr	2/Smr	B	SME204	SME
SMES207	Microelectronics Technology, Industry and Policy Strategy	1		1	Smr	2/Smr	B	NA	SME
SME5018	Advanced Nano-optics	3		3	Fall	4/ Fall	E	NA	SME
EE313	Wireless Communications	3	1	4	Fall	3/Fall	E	EE206	EE

EE316	Microwave Engineering	3	1	4	Fall	3/Fall	E	EE104 EE201-17 EE208	EE
EE322	Optoelectronic Devices Fabrication	2	1	3	Spr	3/Spr	B	EE204	EE
EE323	Digital Signal Processing	3	1	4	Fall	3/Fall	E	EE205	EE
EE326	Digital Image Processing	3	1	4	Spr	3/Spr	E	EE205	EE
EE332	Digital System Design	3	1	4	Spr	3/Spr	E	EE202-17	EE
EE345	Introduction of Wide Bandgap Semiconductors	3		3	Fall	3/Fall	B	EE203 or EE204	EE
EE404	Organic Electronics	2		2	Spr	4/Spr	B	NA	EE
EE411	Information Theory and Coding	2		2	Fall	4/Fall	B	MA212	EE
EES202	Design Based on Lab VIEW Programming	1	1	2	Smr	2/Smr	C	NA	EE
MSE334	Introduction to Energy Materials	2		2	Spr	3/Spr	B	PHY105B PHY104 MSE001	MSE
MSE320	Introduction to Photovoltaic Thermal Technology	3		3	Spr	3/Spr	B	PHY105B EE201-17 EE204	MSE
MSE413	3D Printing and Laser-based Advanced Manufacturing	3		3	Fall	3/Fall	E	NA	MSE
CH212-16	Advanced Instrumentation Systems I	4	2	6	Spr	2/Spr	E	CH101A	CH
CH304	Nanomaterials Synthesis and Nanotechnology	2		2	Spr	3/Spr	E	CH202 CH302	CH
CH306	Laboratory for Micro-Nano Synthesis, Technology and Application	2	2	4	Spr	3/Spr	E	CH202 CH302	CH
ESE212	Environment Monitoring	2		2	Spr	2/Spr	E	NA	ESE
ME102	CAD and Engineering Drawing	3	1.5	4.5	Spr/Fall	1/ Spr or Fall	C	无	ME
ME310	Fundamentals of Measurement Technology	3		3	Spr	3/Spr	B	EE205 ME307	ME
CS205	C/C++Program Design	3	1	4	Spr/Fall	2/Fall	E	NA	CS
CS203B	Data Structures and Algorithm Analysis B	3	1	4	Spr	2/Spr	C	CS102A	CS
CS401	Intelligent Robot	3	1	4	Spr	4/ Spr	B	NA	CS
MAE202	Mechanics of Materials	3		3	Spr	2/Spr	C	MAE203	MAE
MAE303	Fluid Mechanics	4		4	Fall	3/Fall	E	MAE204	MAE
MAE305	Engineering Thermodynamics	3		3	Fall	3/Fall	C	NA	MAE
BMEB131	Introduction to Biomedical Engineering	2		2	Spr	1/Spr	C	NA	BMEB
MA110	MATLAB Programming and Application	3	1	4	Spr	1/Spr	B	NA	MA
MA201b	Ordinary Differential Equations B	4		4	Fall	2/Fall	B	MA102B	MA
MA202	Complex Analysis	3		3	Spr	2/Spr	B	MA203A or MA213	MA
MA206	Mathematical Modelling	3	1	4	Spr	2/Spr		MA203A or MA213	MA

MA212	Probability Theory and Statistics	3		3	Spr	2/Spr	B	MA102B or MA102A	MA
MA303	Partial Differential Equations	3		3	Fall	3/Fall	B	MA201A	MA
MA305	Numerical Analysis	3		3	Fall	3/Fall	C	MA203A or MA213	MA
PHY206-15	Quantum Mechanics I	3		3	Spr	2/Spr	C	PHY205-15 PHY203-15	PHY
Total		144	25	172					

Notes:
1. Students are required to complete 19 credits for the Major Elective Courses.

Table 3: Overview of Practice-Based Courses

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Advised term to take the course	Instruction language	Prerequisite	Dept.
SME201	Fundamentals of Integrated Circuit I- Analog Integrated Circuit	4	1	5	Spr&Fall	2/Spr or Fall	B/E	SME102	SME
SME202	Fundamentals of Integrated Circuit II -Digital Integrated Circuit	4	1	5	Spr&Fall	2/Spr or Fall	B/E	SME102	SME
SME204	Fundamental of Microelectronics II -Semiconductor Device	3	1	4	Spr&Fall	2/Spr or Fall	B/E	SME203	SME
SME305	CMOS VLSI Fabrication Technology	3	1	4	Fall	3/Fall	B	NA	SME
SME306	CMOS VLSI Design	3	2	5	Spr	3/Spr	B	SME202 SME 204	SME
SME307	CMOS Analog Integrated Circuit Design	3	1	4	Fall	3/Fall	B	SME201 SME 204	SME
SME308	Advanced Semiconductor Fabrication Laboratory	3	1.5	4.5	Spr	3/Spr	C	SME 204	SME
SME309	Microprocessor Design	3	1	4	Fall	3/Fall	B	SME202	SME
SME310	Deep learning on chip	3	1		Spr	3/Spr	B	SME 201	SME
SME311	The Foundation of IC Layout Design	1	1		Spr	3/Spr	C	SME306 or SME307	SME
SME312	Electronic Design Automation (EDA) Basics	3	1	4	Spr	3/Spr	E	EE104 MA102B and MA103A	SME
SME317	System-on-a-Chip Design	3	1	4	Fall	3/Fall	B	SME202	SME
SME403	Advanced Microelectronics Experiment III	1	1	2	Spr	4/Fall	B	NA	SME
SME405	Advances in Micro Energy and Micro Sensing	2	1	2	Fall	3/Fall	B		SME
SME470	Internship	2	2	16	Smr	3/Smr	C	NA	SME
SME471	Summer Research	2	2	16	Smr	3/Smr	B	NA	SME
SME490	Thesis(Graduation Project)	8	8	8	Fall/ Spr	4/Fall or Spr	C	NA	SME
EE205	Signals and Systems	3	1	4	Fall	2/Fall	B	NA	EE
EE313	Wireless Communications	3	1	4	Fall	3/Fall	E	EE206	EE
EE316	Microwave Engineering	3	1	4	Fall	3/Fall	E	EE104 EE201-17 EE208	EE
EE322	Optoelectronics Devices Fabrication Laboratory	2	1	3	Spr	3/Spr	B	EE204	EE
EE323	Digital Signal Processing	3	1	4	Fall	3/Fall	E	EE205	EE
EE325	Nonlinear Optimization Techniques for Electrical Engineering	3	1	4	Fall	3/Fall	E	MA102B MA107A	EE
EE326	Digital Image Processing	3	1	4	Spr	3/Spr	E	EE205	EE

EE332	Digital System Design	3	1	4	Spr	3/Spr	E	EE202-17	EE
EES202	Design based on LabVIEW Programming	1	1	8	Smr	2/Smr	C	NA	EE
CH212-16	Advanced Instrumentation Systems I	4	2	6	Spr	2/Spr	E	CH101A	CH
CH306	Laboratory for Micro-Nano Synthesis, Technology and Application	2	2	4	Spr	3/Spr	E	CH202 CH302	CH
CS205	C/C++Program Design	3	1	4	Spr/Fall	2/Fall	E	NA	CS
CS203B	Data Structures and Algorithm Analysis B	3	1	4	Fall	2/Fall	C	CS102A	CS
CS401	Intelligent Robots	3	1	4	Spr	4 Spr	B	NA	CS
MA110	MATLAB Programming and Application	3	1	4	Spr	1/Spr	B	NA	MA
MA206	Mathematical Modelling	3	1	4	Spr	2/Spr		MA203A or MA213	MA
Total		93	44.5	145.5					

Table 4: Overview of Course Hours and Credits

Course Category	Total Course Hours	Total Credits	Credit Requirements	Percentage of the Total*
General Education (GE) Required Courses (not including English courses)		52	52	38%
General Education (GE) Elective Courses			10	7%
Major Foundational Courses	464	24	24	17%
Major Core Courses	464	22	22	16%
Major Elective Courses	2752	144	19	14%
Research Projects, Internship and Undergraduate Thesis/Projects	320	14	12	8%
Total (not including English courses)	4000	256	139	100%

* Percentage of the total= Credit requirements of each line / Total credit requirements

Curriculum Structure of Microelectronics Science and Engineering

First Year	**Fall**	MA101B Calculus I A	MA017A Linear Algebra A	PHY103B General Physics B (I)	CS102B Introduction to Computer Programming B	BIO102B Introduction to Life Science	EE104 Fundamentals of Electric Circuits
	Spr	MA102B Calculus II A		PHY105B General Physics B (II)	PHY104B Experiments of Fundamental Physics	SME102 Fundamentals of Microelectronics and Integrated Circuit	CH101B General Chemistry B
Second Year	**Fall**	EE205 Signals and systems	SME301 Frontier Seminars in Microelectronics and IC Designs I	SME303 Advanced Microelectronics Experiment I	SME201 Analog Integrated Circuit		SME203 Semiconductor Material Physics
	Spr		SME205 Electromagnetic Field and Electromagnetic Wave	SME302 Frontier Seminars in Microelectronics and IC Designs II	SME304 Advanced Microelectronics Experiment II	SME202 Digital Integrated Circuit	SME204 Semiconductor Device
Third Year	**Fall**		SME309 Microprocessor Design	SME307 CMOS Analog Integrated Circuit Design			SME321 Introduction to GaN Semiconductor Materials and Devices
	Spr	SME305 VLSI Fabrication Technology		SME306 CMOS VLSI Design	SME319 Fundamentals of Semiconductor Devices and Packaging		
Forth Year	**Fall**						
	Spr	SME490 Thesis(Graduation Project)					