

PROGRAM HANDBOOK

PhD. Research Mode



Edition: 2025/2026

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This guide contains information that is accurate as of the date of publication. The Collaborative Microelectronic Design excellence Centre (CEDEC) reserves the right to make changes or updates as necessary without prior notice. It is intended as a reference for students enrolled in the 2025/2026 academic session and will remain valid throughout their period of study.

Please be informed that all course synopses provided by CEDEC are presented in English, which is the official language of instruction for these courses.

For further inquiries, please contact:

Director

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DIRECTOR'S FOREWORD



It is with great pleasure that I welcome you to the Doctorate in Microelectronic Engineering programme for the Academic Year 2025/2026. As you embark on this academic journey, you are joining a community dedicated to fostering advanced knowledge, research excellence, and professional growth.

This programme is designed to immerse you in rigorous research, fostering critical thinking, advanced problem-solving, and specialized expertise in your chosen field. You will gain the skills and experience needed to undertake independent, high-impact research that meets the evolving demands of industry and academia. Whether your goal is to deepen your knowledge, advance your career, or pursue further academic opportunities, this programme provides a strong foundation to support your aspirations.

As postgraduate students, you are not only learners but contributors to the creation of knowledge. We encourage you to approach your studies with curiosity, commitment, and a collaborative spirit. Make full use of the resources available such as your supervisors, lecturers, peers, and the broader university ecosystem.

This handbook serves as your guide throughout your time in the programme. It contains essential information on academic regulations, programme structure, and expectations. I urge you to read it carefully and refer to it regularly.

On behalf of the faculty and academic staff, I wish you every success in your studies and future endeavors. May your time here be intellectually enriching, professionally and personally rewarding.

Prof. Dr. Asrulnizam Bin Abd Manaf

Director of CEDEC

OUR VISION

To become a regional referral center for microelectronics



OUR MISSION

To be a center for the dissemination and generation of knowledge in the field of integrated circuit design through:

- Conducting and fostering interdisciplinary research capabilities that are relevant to the development of the country's electronics industry
- Producing quality human capital to meet the demands of the industry in line with the latest technological development
- Strengthening industrial linkages and establishing collaboration with research institutes at national and international levels

BACKGROUND & HISTORY

Collaborative Microelectronic Design Excellence Centre (CEDEC) was established at Universiti Sains Malaysia in 2007 with budget approval from the Ministry of Finance in 2005. However, efforts to empower universities in this field were initiated even earlier. The development of CEDEC's infrastructure, which included a computer network for accessing microelectronic design software (EDA tools) nationwide, was completed in November 2006. CEDEC continued to gain publicity when it was included in the 3rd Industrial Master Plan (IMP3) 2006–2020 (pages 262–265), the National Economic Report 2007/2008 (pages 45–46), during the launch of the NCER in 2008, and it later received approval to be placed under the Senate in 2015.

CEDEC began operating at USM as a research center in 2007 with 14 staff members. Six fellows from Universiti Malaya, Universiti Kebangsaan Malaysia, Universiti Putra Malaysia, Universiti Teknologi Malaysia, Universiti Teknologi Mara, and Multimedia University were appointed by the CEDEC Director, and the projects undertaken were collaborative in nature. These appointments lasted for three years, until 2010.

In 2014, CEDEC underwent a restructuring process in which it was transferred to Sains@USM and taken over by the new CEDEC Director, Prof. Dr. Mohd Zaid Bin Abdullah. Following this relocation, collaboration in PSM (Human Resource Centre) among industries, public sector organizations, and academia was further strengthened.

Additionally, CEDEC serves as an interface between the academic engineering world and industry, with the aim of enhancing teaching, research, and industrial applications through shared facilities. This initiative was implemented through the signing of a collaboration agreement with Silterra Malaysia for the MPW (Multiproject Wafer) program and a Memorandum of Agreement (MOA) with several industries and universities for a 3D program to be launched this year.

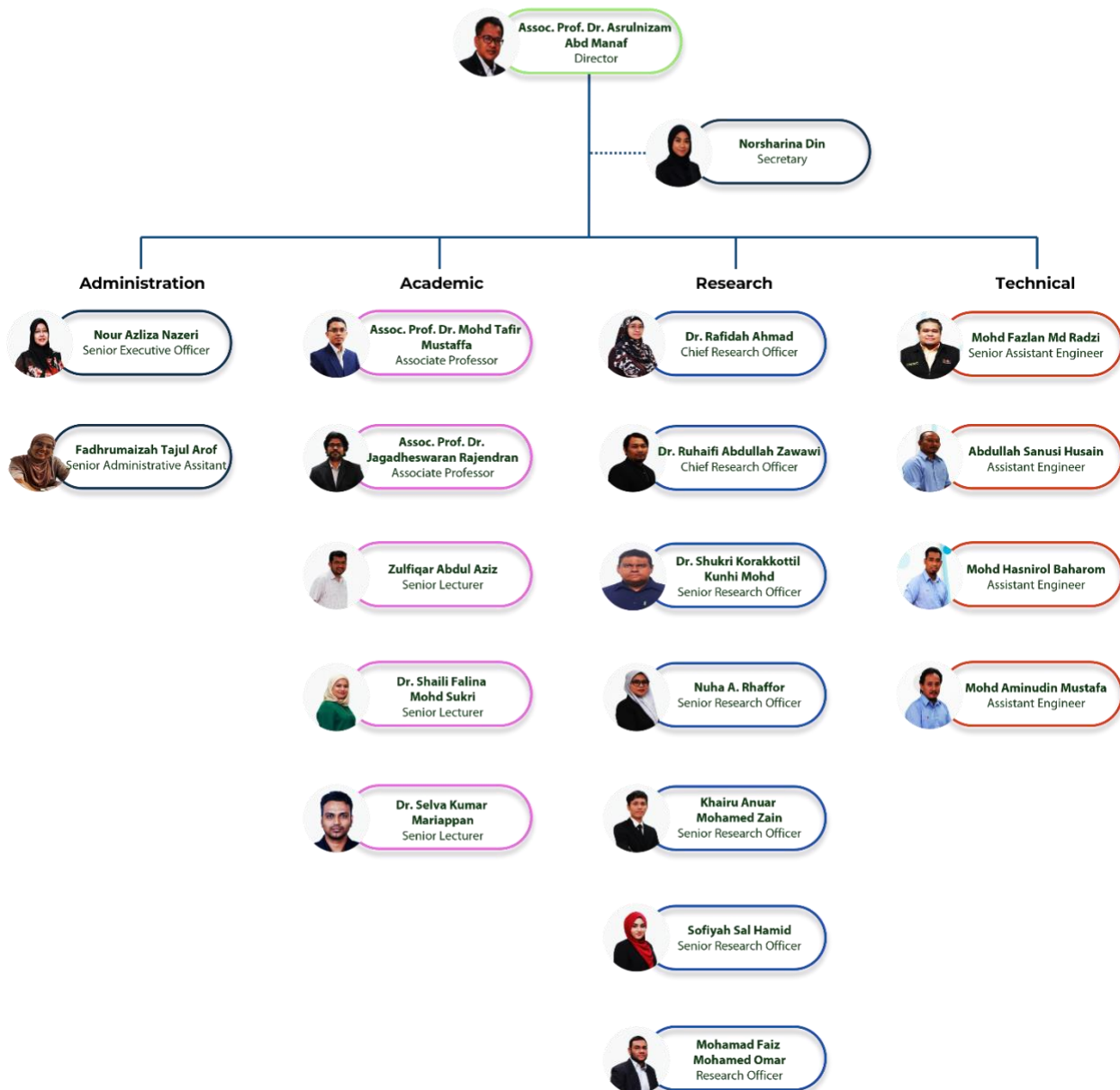
In line with this, CEDEC is able to produce highly skilled design engineers and researchers to meet the needs of the rapidly growing global semiconductor industry.

ORGANIZATIONAL CHART



COLLABORATIVE MICROELECTRONIC DESIGN EXCELLENCE CENTRE (CEDEC)

ORGANIZATION CHART



DOCTORATE RESEARCH MODE PROGRAM

PROGRAMME OVERVIEW

The Collaborative Microelectronic Design Excellence Centre (CEDEC) is a nationally and internationally recognized research center specializing in microelectronic engineering. With strong expertise, advanced facilities, and strategic collaborations, CEDEC plays a vital role in driving Malaysia's capabilities in integrated circuit (IC) design and semiconductor technology. CEDEC is currently the only center in Malaysia that offers a fully integrated platform for Electronic Design Automation (EDA) in Very-Large-Scale Integration (VLSI) and microfabrication facilities under one roof, enabling complete end-to-end development from design to testing.

As part of its mission to support talent development and high-impact research, CEDEC offers the *Doctorate programme in Microelectronic Engineering*. This program is designed to equip students with both theoretical knowledge and practical skills in areas such as analog/digital IC design, semiconductor devices, system-on-chip development, and microfabrication. Students will undertake supervised research projects aligned with CEDEC's focus areas, contributing to innovation and industry-relevant solutions. Graduates of the program will be well-prepared for careers in the semiconductor industry, research institutions, or further academic study, supporting CEDEC's role as a center of excellence that bridges academia and industry.

In addition to academic and research opportunities, students will benefit from CEDEC's strong linkages with industry partners, providing exposure to real-world engineering problems, collaborative projects, and potential career pathways. The program is ideal for those who are passionate about advancing microelectronic technologies and want to be part of a forward-thinking, innovation-driven research environment.

PROGRAM EDUCATION OUTCOMES (PEO)

PEO1: Able to integrate concepts, theories, methods, and current knowledge in conducting high-quality research that contributes to the well-being of local and global communities.

PEO2: Capable of critically and accurately analyzing problems, and integrating creative and innovative solutions through current digital platforms to address real-world challenges.

PEO3: Uphold professional and ethical values in fulfilling their responsibilities towards employers, society, and the nation.

PEO4: Demonstrate confident and effective communication skills in conveying knowledge through both verbal and written means.

PEO5: Actively pursue new knowledge and engage in multidisciplinary collaboration with stakeholders to drive sustainable socio-economic development at both community and national levels.

PROGRAM LEARNING OUTCOMES (PLO)

PLO1 (Knowledge and understanding)	Integrate significant knowledge in the relevant field by applying appropriate and up-to-date approaches.
PLO2 (Critical thinking)	Critically interpret and precisely articulate the outcomes of research.
PLO3 (Psychomotor skills)	Develop original, high-quality, and effective methods for problem-solving in the relevant field through appropriate research approaches.
PLO4 (interpersonal skill)	Demonstrate the ability to collaborate with various parties in conducting research and uphold strong social ethics.
PLO5 (Communication skill)	Demonstrate maturity of knowledge and the ability to present and defend research clearly, confidently, and effectively.
PLO6 (Digital skill)	Able to justify the research findings using various digital technologies and software appropriate to the research methodology.
PLO7 (Data analysis skill)	Validate the research findings by using analyses appropriate to the methods and results of the study, ensuring that the conclusions drawn are accurate and impactful.
PLO8 (Leadership, interpersonal and social skills)	Demonstrate a responsible attitude in conducting research, exercise sound judgment in decision-making, and show cooperation in managing the research work.
PLO9 (Personal skill)	Demonstrate a high level of motivation in exploring new knowledge, manage research resources effectively, and organize information systematically and in detail.
PLO 10 (Entrepreneurship skill)	Not Applicable
PLO11 (Ethics and professionalism)	Comply with safety regulations and instructions, and uphold principles, professionalism, and ethics in conducting research.

RESEARCH FIELD AND SPECIALIZATION

 <p><i>Director</i> ASSOC. PROF. DR. ASRULNIZAM ABD MANAF</p>	<p>Academic Background: B.Eng. Toyohashi University of Technology, JAPAN Msc. Toyohashi University of Teknology, JAPAN Ph.D. Keio University, Tokyo, JAPAN</p> <p>Research Interest / Area of Specialization: Analog Integrated Circuitry (PMU IC, BGR, LDO, Rectifier, Switch Capacitor Circuitry, CMOS Sensing Interface), MEMS, Lab On PCB, Printed Stretchable Electronic, IOT Device, Smart Sensor.</p> <p>eeasrulnizam@usm.my https://experts.usm.my/cvitaee/eeasrulnizam +604-6535619</p>
 <p><i>Program Chairman MSc. Mixed Mode/ Postgraduate Studies</i> DR. SHAILI FALINA MOHD SUKRI</p>	<p>Academic Background: B.Eng.(Hons) Universiti Malaysia Perlis, MALAYSIA Ph.D. Waseda University, Tokyo, JAPAN</p> <p>Research Interest / Area of Specialization: Surface chemistry Wide bandgap materials Carbon-based biosensor Electrochemical Sensors Field-Effect Transistor Devices AlGaIn/GaN HEMT Devices</p> <p>shailifalina@usm.my https://experts.usm.my/cvitaee/shailifalina +604-6535703</p>



Assoc. Professor
**ASSOC. PROF. DR. JAGADHESWARAN
 RAJENDRAN**

Academic Background:

B Eng (Hons) Universiti Sains Malaysia, MALAYSIA
 M.Eng , Multimedia University, MALAYSIA
 Ph.D University of Malaya, MALAYSIA

Research Interest / Area of Specialization:

CMOS Radio Frequency Integrated Circuit (RFIC Design)
 CMOS Analog Integrated Circuit Design
 CMOS Phase Locked Loop (PLL)
 CMOS 5G Transceiver
 GaAs Monolithic Microwave Integrated Circuit (MMIC)
 Radio Frequency Energy Harvester (RFEH)
 Antenna

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Assoc. Professor
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 MOHD TAFIR MUSTAFFA**

Academic Background:

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Research Interest / Area of Specialization:

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 CMOS Analog Integrated Circuit Design
 CMOS Digital Integrated Circuit Design

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Senior Lecturer
MR ZULFIQAR ALI BIN ABD. AZIZ

Academic Background:

BSc. University of Florida, Gainesville, USA

MSc. University of Southampton, UNITED KINGDOM

Research Interest / Area of Specialization:

Microelectronics (VLSI & Analog IC)

Field Mixed Signal Data Converters, Analog design

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Senior Lecturer
DR. SELVA KUMAR A/L MARIAPPAN

Academic Background:

B. Tech. Eng (Hons) University Teknikal Malaysia

Ph.D University Sains Malaysia, MALAYSIA

Research Interest / Area of Specialization :

CMOS Radio Frequency Integrated Circuit (RFIC Design)

CMOS Analog Integrated Circuit Design

CMOS 5G Transceiver

Radio Frequency Energy Harvester (RFEH)

Radio Frequency Antenna

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DOCTORATE (Ph.D) RESEARCH MODE GRADUATION REQUIREMENTS

A Research Mode student must comply with the following graduation requirements:

- a. Fulfill the minimum duration of candidature.
- b. Pass the pre-requisite courses (if any) as determined by the School/Centre/Institute.
- c. Must obtain minimum grade C for Malaysian Culture and Malay Language (LKM111). This course is compulsory for all international students.
- d. Pass the Research Methodology course.
- e. One (1) article journal, accepted by or published in a journal indexed by WoS in Q1/Q2

OR

At least two (2) articles journal accepted or published in journals indexed by WoS/SCOPUS

The published/accepted journals are required to comply with the following requirements:

Authorship	Publications accepted must be published with the supervisor(s). The candidate must be the first student author. Only the first student author is allowed to use this article to fulfil his/her graduation requirement.
Plagiarism	Plagiarized article will not be accepted for graduation requirement.
Topic of Publications	Publications accepted must be related to his/her thesis/dissertation.
Affiliation	Publications accepted must carry USM affiliation.
Blacklisted Journals	<p>Publications in the following journals are NOT accepted:</p> <ul style="list-style-type: none">▪ List of blacklisted journal publishers by Ministry of Higher Education, Malaysia https://referencephs.usm.files.wordpress.com/2013/06/four-4-publishers-not-recognized-by-malaysia-ministry-of-education.pdf▪ Beall's List of Predatory Publishers: https://predatoryjournals.com/publishers/▪ Beall's List of Predatory Journals: https://predatoryjournals.com/journals/

CEDEC'S FACILITIES

1. Computer Laboratory

The Computer Laboratory at CEDEC is a dedicated facility that plays a crucial role in supporting both teaching and research activities in the field of IC design and semiconductor advancement. It serves as a central hub for hands-on learning, providing students with the opportunity to apply theoretical knowledge through practical design and simulation work.

The lab is equipped with 18 high-performance workstations, each installed with fully licensed, industry-standard Electronic Design Automation (EDA) tools such as Cadence, Synopsys, Mentor Graphics, and Silvaco. These tools enable the complete IC design workflow, from schematic capture and simulation to layout design, verification, and design rule checking, mirroring real-world engineering practices.

Designed to support both undergraduate and postgraduate students, the facility bridges the gap between classroom learning and industry-relevant experience, making it an essential component of CEDEC's mission to produce competent, industry-ready graduates in the field of microelectronics.



2. Integrated Circuit (IC) Design Laboratory

In addition to software, Integrated Circuit (IC) Design laboratory in CEDEC is equipped with all the essential hardware and infrastructure required for IC design, providing a comprehensive and professional-grade environment for design, simulation, testing, and validation. This complete setup supports both academic and industrial design workflows.

The facility is actively used for postgraduate research, final-year projects, and collaborative research with industry partners, both locally and internationally. It also plays a strategic role in national development by supporting training and talent development. Through CEDEC's partnerships and long-standing reputation, students have opportunities to participate in cutting-edge design projects and gain experience aligned with industry expectations.





3. Lab-on-Chip and Printable Electronic Laboratory

The Lab-on-Chip and Printable Electronics Laboratory at CEDEC is a multidisciplinary research facility that supports the development of miniaturized analytical devices and flexible electronic systems. It plays a crucial role in advancing research in biosensing, microfluidics, and printed electronics, with applications in healthcare, environmental monitoring, and point-of-care diagnostics.

The laboratory is equipped with essential tools for the development of integrated sensing platforms. Key equipment includes two potentiostats for electrochemical sensor development and characterization, along with a microfluidic setup that enables precise handling and manipulation of fluid samples within micro-scale channels.

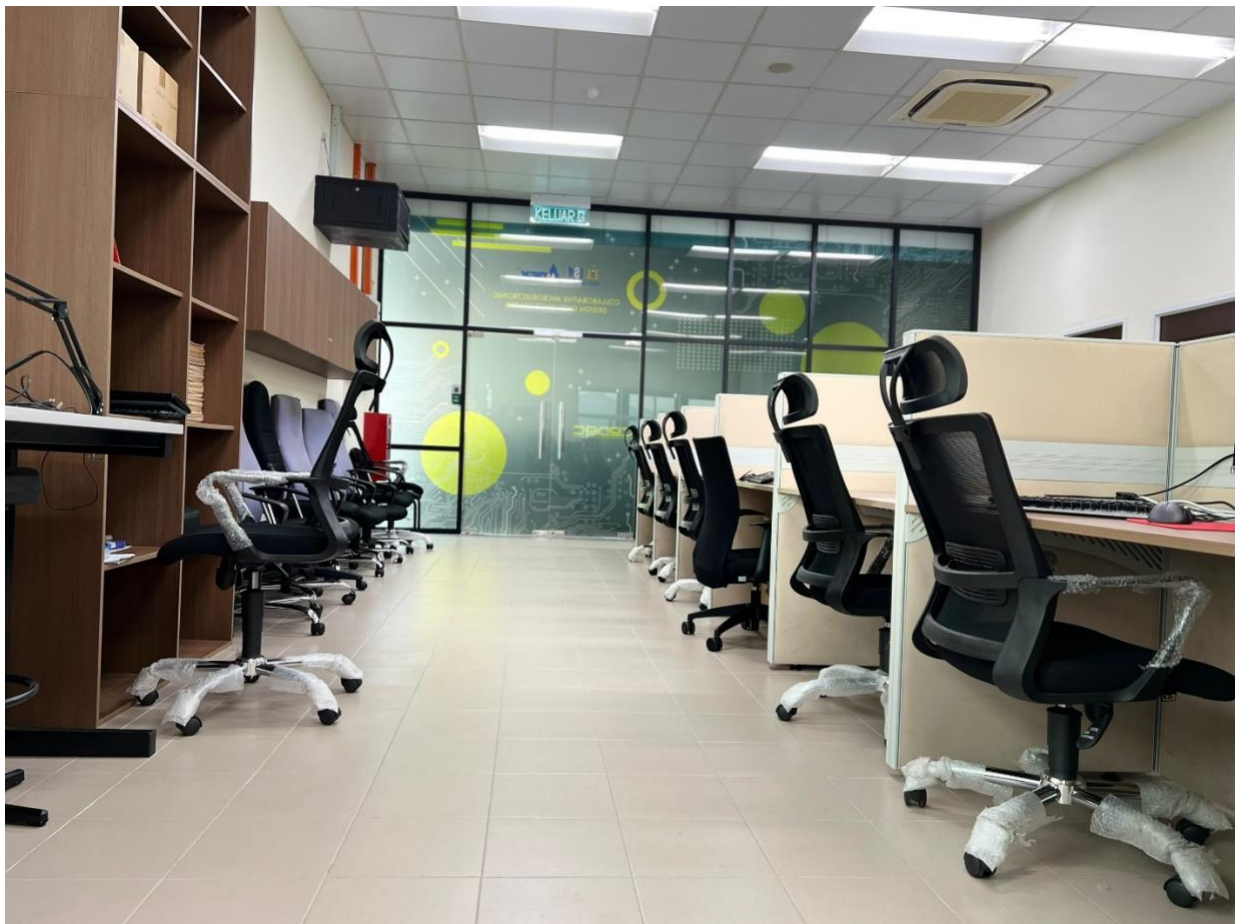
In addition, the laboratory supports the fabrication of low-cost, flexible, and scalable electronic components. A screen printer is available for depositing conductive inks onto flexible substrates such as plastic or paper, enabling the production of printed sensors, circuits, and electrodes. This capability facilitates ongoing research in wearable technologies, disposable diagnostics, and sustainable electronics.



4. Postgraduates Room

The Postgraduate Room on the 7th floor of the I2U Building provides a quiet and comfortable space for CEDEC postgraduate students to focus on their studies and research. The room is equipped with basic workstations and seating, making it suitable for writing, reading, and light computing tasks.

A pantry area is also available for students to take short breaks and refresh themselves. While simple in design, the space offers a cozy environment that supports both individual work and a sense of community among students.



CEDEC'S DIRECTORY

Director's Office	Name	Phone No.	Ext.
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Assistant Engineer	En. Mohd Hasnirol Bin Baharom hasnirol@usm.my	04-653 5629	5629
Assistant Engineer	En. Mohd Aminudin Bin Mustafa Mohd.aminudin@usm.my	04-653 5631	5631
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Server Room			5634
Postgraduates Room I ² U		04-653 5667	5667

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Senior Lecturer	Dr. Shaili Falina Bt Mohd Sukri shailifalina@usm.my	04-653 5703	5703
Senior Lecturer	Dr. Selva Kumar A/I Mariappan selva_kumar@usm.my	04-653 5667	5667
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Analog IC Design Research Officer	Dr. Ruhaifi Bin Abdullah Zawawi ruhaifi@usm.my	04-653 5619	5619
Analog IC Design Research Officer	Dr. Shukri Bin Korakkottil Kunhi Mohd shukri.mohd@usm.my	04-653 5630	5630
System Embedded / Digital IC Design Research Officer	En. Khairu Anuar Bin Mohamed Zain anuar@usm.my	04-653 5626	5626
Analog IC Design Research Officer	Pn. Sofiyah Binti Sal Hamid sofiyah@usm.my	04-653 5622	5622
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ACADEMIC CALENDAR - ACADEMIC SESSION 2025/2026

FOR ALL SCHOOLS (EXCEPT FOR SCHOOL OF MEDICAL SCIENCES AND SCHOOL OF DENTAL SCIENCES)

Main Campus : Registration for New Student (26 - 28 September 2025) / **Orientation Week (29 September - 04 October 2025)

Engineering Campus : Registration for New Student (28 September 2025) / **Orientation Week (29 September - 04 October 2025)

Health Campus : Registration for New Student (30 September 2025) / **Orientation Week (30 September - 04 October 2025)

SEM	WEEKS	ACTIVITIES		DATE	REMARKS
ONE	1	Teaching & Learning (T&L 7 Weeks)		Monday, 06.10.2025 - Sunday, 12.10.2025	
	2			Monday, 13.10.2025 - Sunday, 19.10.2025	
	3			Monday, 20.10.2025 - Sunday, 26.10.2025	20.10.2025, Monday - Deepavali**
	4			Monday, 27.10.2025 - Sunday, 02.11.2025	
	5			Monday, 03.11.2025 - Sunday, 09.11.2025	
	6			Monday, 10.11.2025 - Sunday, 16.11.2025	
	7			Monday, 17.11.2025 - Sunday, 23.11.2025	
	8	Mid Semester Break (1 Week)		Monday, 24.11.2025 - Sunday, 30.11.2025	
	9	Teaching & Learning (T&L 7 Weeks)		Monday, 01.12.2025 - Sunday, 07.12.2025	
	10			Monday, 08.12.2025 - Sunday, 14.12.2025	
	11			Monday, 15.12.2025 - Sunday, 21.12.2025	
	12			Monday, 22.12.2025 - Sunday, 28.12.2025	25.12.2025, Thursday - Christmas Day
	13			Monday, 29.12.2025 - Sunday, 04.01.2026	01.01.2026, Thursday - New Year of 2025
	14			Monday, 05.01.2026 - Sunday, 11.01.2026	
	15			Monday, 12.01.2026 - Sunday, 18.01.2026	
	16	Revision Week (1 Week)		Monday, 19.01.2026 - Sunday, 25.01.2026	
	17	Examination (3 Weeks)		Monday, 26.01.2026 - Sunday, 01.02.2026	01.02.2026, Sunday - Thaipusam
	18			Monday, 02.02.2026 - Sunday, 08.02.2026	02.02.2026, Sunday - Replacement leave for Thaipusam (Main & Engineering Campus)
	19			Monday, 09.02.2026 - Sunday, 15.02.2026	
	20	Mid Semester Break / Industrial Training (4 Weeks)		Monday, 16.02.2026 - Sunday, 22.02.2026	17 & 18.02.2026, Tuesday & Wednesday - Chinese New Year 19.02.2026, Thursday - 1st day of Ramadhan
	21			Monday, 23.02.2026 - Sunday, 01.03.2026	
	22			Monday, 02.03.2026 - Sunday, 08.03.2026	07.03.2026, Saturday - Nuzul Al-Quran
	23			Monday, 09.03.2026 - Sunday, 15.03.2026	
TWO	24/1	Teaching & Learning (T&L 7 Weeks)		Monday, 16.03.2026 - Sunday, 22.03.2026	21.03.2026 & 22.03.2026, Saturday & Sunday - Eid al-Fitr**
	25/2			Monday, 23.03.2026 - Sunday, 29.03.2026	23.03.2026, Monday - Replacement leave for Eid al-Fitr****
	26/3			Monday, 30.03.2026 - Sunday, 05.04.2026	
	27/4			Monday, 06.04.2026 - Sunday, 12.04.2026	
	28/5			Monday, 13.04.2026 - Sunday, 19.04.2026	
	29/6			Monday, 20.04.2026 - Sunday, 26.04.2026	
	30/7			Monday, 27.04.2026 - Sunday, 03.05.2026	01.05.2026, Friday - Labour Day
	31/8	Mid Semester Break (1 Week)		Monday, 04.05.2026 - Sunday, 10.05.2026	
	32/9	Teaching & Learning (T&L 7 Weeks)		Monday, 11.05.2026 - Sunday, 17.05.2026	
	33/10			Monday, 18.05.2026 - Sunday, 24.05.2026	
	34/11			Monday, 25.05.2026 - Sunday, 31.05.2026	27 & 28.05.2026, Wednesday & Thursday - Eid al-Adha** 31.05.2026, Sunday - Wesak Day
	35/12			Monday, 01.06.2026 - Sunday, 07.06.2026	01.06.2026, Monday - Replacement leave for Wesak Day (Main & Engineering Campus) 01.06.2026, Monday - Yang di-Pertuan Agong's Birthday
	36/13			Monday, 08.06.2026 - Sunday, 14.06.2026	
	37/14			Monday, 15.06.2026 - Sunday, 21.06.2026	17.06.2026, Wednesday - Awal Muharram
	38/15			Monday, 22.06.2026 - Sunday, 28.06.2026	
	39/16	Revision Week (1 Week)		Monday, 29.06.2026 - Sunday, 05.07.2026	
	40/17	**Examination (2 Weeks)	Examination (3 Weeks)	Monday, 06.07.2026 - Sunday, 12.07.2026	07.07.2026, Tuesday - Georgetown World Heritage City Day 11.07.2026, Saturday - Penang Governor's Birthday
	41/18			Monday, 13.07.2026 - Sunday, 19.07.2026	
	42/19			Monday, 20.07.2026 - Sunday, 26.07.2026	
COURSES DURING LONG BREAK / SEMESTER BREAK	43/20	Long Semester Break / Industrial Training (10/11 Weeks)		Monday, 27.07.2026 - Sunday, 02.08.2026	
	44/21			Monday, 03.08.2026 - Sunday, 09.08.2026	
	45/22			Monday, 10.08.2026 - Sunday, 16.08.2026	
	46/23			Monday, 17.08.2026 - Sunday, 23.08.2026	
	47/24			Monday, 24.08.2026 - Sunday, 30.08.2026	25.08.2026, Tuesday - Maulidur Rasul
	48/25			Monday, 31.08.2026 - Sunday, 06.09.2026	31.08.2026, Monday - National Day
	49/26			Monday, 07.09.2026 - Sunday, 13.09.2026	
	50/27			Monday, 14.09.2026 - Sunday, 20.09.2026	16.09.2026, Wednesday - Malaysia Day
	51/28			Monday, 21.09.2026 - Sunday, 27.09.2026	29 & 30.09.2026, Tuesday & Wednesday - Sultan of Kelantan's Birthday (Health Campus)
	52/29			Monday, 28.09.2026 - Sunday, 04.10.2026	

