

School of Electronic Systems and Automation

CURRICULUM STRUCTURE 2023

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TEACHING AND LEARNING METHOD

I.1 OVERVIEW

The School of Electronic Systems and Automation, Digital University Kerala, follows experiential learning. The focus is on the learner rather than the teacher in this model of education. All classes are conducted within the labs and field environment. A variety of learning methods are adopted in the program to ensure a wide variety of outcomes, which includes:

1. A better understanding of course material through industry projects
2. A broader view of the world and an appreciation of community
3. Insight into their own skills, interests, passions, and values
4. First hand experience on working on product development
5. Opportunities to collaborate with diverse industries and people
6. Positive professional practices and skill sets
7. The gratification of assisting in meeting community needs
8. Self-confidence and leadership skills

I.2 PRIMARY RULES

1. Every taught course should have at least one industry lecture
2. Every taught course should address at least one specific industrial application
3. Project or product development is a mandatory activity in every semester
4. Its mandatory that every student works on an industry relevant problem from first semester
5. Patents and publications are encouraged provided they are of high quality

I.3 SCHOLARSHIPS AND FUNDING

Internships and funding are provided by application through the following schemes:

1. India Innovation Centre for Graphene (MeitY funded)
2. CoE on IIOT Sensors (MeitY funded)
3. CoE on Electronic Design and Test
4. GATE fellowships
5. Digital Science Park - centers
6. AI chip centre (Chip to Startup Program - MeitY)
7. Specific industry projects/ Faculty research projects/ School fellowships

MSc ELECTRONICS

The MSc Electronics consists of the following Major/Minor specialisations:

1. Agrifood Electronics
2. Unconventional Computing
3. Sensors
4. VLSI
5. AI hardware
6. Biomedical Electronics
7. Applied Materials
8. Signal Processing Hardware
9. IOT and Robotics

Multiple major or minor are allowed. Major specialisation requires 30 credits and minor specialisation requires 9 credits.

2.1 ADMISSION REQUIREMENTS

1. Any branch of BSc/B.Tech/BCA/MBBS with minimum 60% in qualifying examination.
2. Relaxation in qualifying examination percentage applicable as per University norms for SC/ST/SEBC/Divyaang category candidates. Entry-level requirement is a minimum score of 60 percentage marks OR CPI/CGPA of 6.5 or above in 10 points in the qualifying degree. Rounding off of marks is not allowed. A candidate with CGPA less than 6.5 will also be eligible if the equivalent percentage for graduation is above 60% as per the respective university norms for conversion from CGPA to percentage. In such a case, the candidate will have to produce the official document or percentage equivalence certificate from the respective university showing CGPA to percentage conversion norms, at the time of admission. Students who have scored less than 60% in their graduation degree are not eligible for admission to the courses of Digital University Kerala. Candidates belonging to SC/ST and Persons with Disability categories are eligible for applying if they have minimum pass marks in the qualifying examination. SEBC candidates of Kerala State who are certified as belonging to non-creamy layer are eligible for 5% relaxation in the minimum required marks for qualifying examination, provided that the candidates have passed the examination.

2.2 PROGRAM STRUCTURE

2.2.1 Semester I

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3122000	Digital Access for Community Empowerment - I	3	1	2	300	UC
M3122011	Creativity and Art for Engineering Sciences	2	1	1	300	PC
M1122001	Basic electronic devices and circuits	3	1	2	100	PC
M2123001	Sensors and transducers for IOT	2	1	1	200	PC
M2122002	Linear circuit theory	3	1	2	200	PC
M2123005	AI Hardware and Embedded IoT lab	2	1	1	200	PC
M4120401	Group Project - I	3	0	3	400	PE

2.2.2 Semester 2

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3122101	Digital Access for Community Empowerment - II	2	0	2	300	UC
M3120026	Finance for non-finance managers	2	1	1	300	PE
M3120051	Intellectual Property Rights	2	1	1	300	PE
M3123002	CMOS integrated Operational amplifiers	3	1	2	200	PC
M2123003	Verilog programming and Deep Learning lab	3	1	2	200	PE
M3123001	VLSI physical design of Neural Processors	3	1	2	300	PE
M2123004	Mixed Signal VLSI physical design lab	2	1	1	200	PE
M2122006	Analog Circuits for Integrated Sensors	3	1	2	300	PE

2.2.3 Semester 3

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M4120402	Group Project - II	6	0	6	400	OE
M4120403	Individual Project	3	0	3	400	OE
-	Open Electives	3	0	3	300	OE

Specialisation Electives: Agrifood Electronics

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3121201	Agrifood production	3	0	3	300	OE
M3121202	Precision agriculture	3	0	3	300	OE
M3121203	Control Systems	3	0	3	300	OE

Specialisation Electives: Unconventional Computing

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3122201	Quantum Computing	3	0	3	300	OE
M3122202	Neuromorphic VLSI	3	0	3	300	OE
M3122203	Bioinspired Computing	3	0	3	300	OE

Specialisation Electives: Sensors

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3123201	Microfabrication techniques	3	0	3	300	OE
M3123202	MEMS/NEMS	3	0	3	300	OE
M3123203	Industrial standards for sensors	3	0	3	300	OE

Specialisation Electives: VLSI

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3124201	PLL	3	0	3	300	OE
M3124202	Filters	3	0	3	300	OE
M3124203	Data converters	3	0	3	300	OE

Specialisation Electives: AI hardware

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3125201	Neuromorphic VLSI	3	0	3	300	OE
M3125202	Emerging Memories	3	0	3	300	OE
M3125203	RISC-V Processor Design	3	0	3	300	OE

Specialisation Electives: Biomedical Electronics

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3126201	Flexible electronics	3	0	3	300	OE
M3126202	Biomedical materials	3	0	3	300	OE
M3126203	Biomedical Instrumentation	3	0	3	300	OE

Specialisation Electives: Applied Materials

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3127201	Composites and polymers	3	0	3	300	OE
M3127202	Batteries	3	0	3	300	OE
M3127203	Green Energy	3	0	3	300	OE

Specialisation Electives: Signal Processing Hardware

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3128201	FPGA and DSP processors	3	0	3	300	OE
M3128202	Real-time Image Processing	3	0	3	300	OE
M3128203	Medical imaging hardware	3	0	3	300	OE

Specialisation Electives: IOT and Robotics

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3129201	Wireless Sensor Networks	3	0	3	300	OE
M3129202	Mechatronics and control systems	3	0	3	300	OE
M3129203	5G communication for robotics	3	0	3	300	OE

2.2.4 Semester 4

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M4120404	Final Year Project	15	0	15	400	P
M4120405	Research Paper	3	0	3	500	OE

MSc APPLIED PHYSICS

The MSc Applied Physics consists of the following Major/Minor specialisations:

1. Semiconductors
2. VLSI Design
3. Applied Materials

Multiple major or minor are allowed. Major specialisation requires 30 credits and minor specialisation requires 9 credits.

3.1 ADMISSION REQUIREMENTS

1. Any branch of BSc/B.Tech/BCA/MBBS with minimum 60% in qualifying examination.
2. Relaxation in qualifying examination percentage applicable as per University norms for SC/ST/SEBC/Divyaang category candidates.
3. Entry-level requirement is a minimum score of 60 percentage marks OR CPI/CGPA of 6.5 or above in 10 points in the qualifying degree. Rounding off of marks is not allowed. A candidate with CGPA less than 6.5 will also be eligible if the equivalent percentage for graduation is above 60% as per the respective university norms for conversion from CGPA to percentage. In such a case, the candidate will have to produce the official document or percentage equivalence certificate from the respective university showing CGPA to percentage conversion norms, at the time of admission. Students who have scored less than 60% in their graduation degree are not eligible for admission to the courses of Digital University Kerala. Candidates belonging to SC/ST and Persons with Disability categories are eligible for applying if they have minimum pass marks in the qualifying examination. SEBC candidates of Kerala State who are certified as belonging to non-creamy layer are eligible for 5% relaxation in the minimum required marks for qualifying examination, provided that the candidates have passed the examination.

3.2 PROGRAM STRUCTURE

3.2.1 Semester I

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3120600	Digital Access for Community Empowerment - I	3	1	2	300	UC
M3120605	Creativity and Art for Engineering Sciences	2	1	1	300	PC
M1120601	Basic electronic devices and circuits	3	1	2	100	PC
M2120602	Sensors and transducers for IOT	2	1	1	200	PC
M2120603	Quantum Mechanics	3	1	2	200	PC
M2120604	AI Hardware and Embedded IoT lab	2	1	1	200	PC
M4120601	Group Project - I	3	0	3	400	PE

3.2.2 Semester 2

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3121600	Digital Access for Community Empowerment - II	2	0	4	300	UC
M3120626	Finance for non-finance managers	2	1	1	300	PE
M3120651	Intellectual Property Rights	2	1	1	300	PE
M3120606	CMOS integrated Operational amplifiers	3	1	2	200	PC
M3120621	Verilog programming and Deep Learning lab	3	1	2	200	PE
M3120623	Mixed Signal VLSI physical design lab	2	1	1	200	PE
M3120624	Analog Circuits for Integrated Sensors	3	1	2	300	PE
M3120625	VLSI physical design of Neural Processors	3	1	2	300	PE

3.2.3 Semester 3

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M4120602	Group Project - II	6	0	6	400	OE
M4120603	Individual Project	3	0	3	400	OE
-	Open Electives	3	0	3	300	OE

Specialisation Electives: VLSI

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3122601	PLL	3	0	3	300	OE
M3122602	Filters	3	0	3	300	OE
M3122603	Data converters	3	0	3	300	OE

Specialisation Electives: Applied Materials

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3123601	Composites and polymers	3	0	3	300	OE
M3123602	Batteries	3	0	3	300	OE
M3123603	Green Energy	3	0	3	300	OE

Specialisation Electives: Semiconductors

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3121601	Electrodynamics	3	0	3	300	OE
M3121602	Graphene and 2D Materials	3	0	3	300	OE
M3121603	Semiconductor Physics	3	0	3	300	OE
M3121604	Optoelectronics and lasers	3	0	3	300	OE
M3121605	Characterisation techniques	3	0	3	300	OE

3.2.4 Semester 4

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M4121604	Final Year Project	15	0	15	400	P
M4121605	Research Paper	3	0	3	500	OE

M.TECH ELECTRONICS ENGINEERING

The M.Tech Electronics Engineering consists of the following Major/Minor specialisations:

1. Agrifood Electronics
2. Unconventional Computing
3. Sensors
4. VLSI
5. AI hardware
6. Biomedical Electronics
7. Applied Materials
8. Signal Processing Hardware
9. IOT and Robotics

Multiple major or minor are allowed. Major specialisation requires 30 credits and minor specialisation requires 9 credits.

4.1 ADMISSION REQUIREMENTS

1. B.Tech or BE in EE/ECE/AEI/EI/Robotics/IoT or similar electronics hardware branches. MSc Electronics/Instrumentation or equivalent with 60% marks in graduation. CS/CSE/IT or similar computing focused branches are not eligible.
2. Entry-level requirement is a minimum score of 60 percentage marks OR CPI/CGPA of 6.5 or above in 10 points in the qualifying degree. Rounding off of marks is not allowed. A candidate with CGPA less than 6.5 will also be eligible if the equivalent percentage for graduation is above 60% as per the respective university norms for conversion from CGPA to percentage. In such a case, the candidate will have to produce the official document or percentage equivalence certificate from the respective university showing CGPA to percentage conversion norms, at the time of admission. Students who have scored less than 60

4.2 PROGRAM STRUCTURE

4.2.1 Semester 1

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3112003	Digital Access for Community Empowerment - I	3	1	2	300	UC
M3110041	Creativity and Art for Engineering Sciences	2	1	1	300	PC
M3110003	Non-linear Circuit Theory	3	1	2	300	PC
M3110004	Electronics for Edge AI	2	1	1	300	PC
M3110005	Sensors for Drones and Robotics	3	1	2	300	PC
M3110030	Programing in Python	3	2	1	300	PE
M3110031	Embedded Systems Essentials with Arm 1	2	0	2	300	PE

4.2.2 Semester 2

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M3112103	Digital Access for Community Empowerment - II	2	0	2	300	UC
M3120626	Finance for non-finance managers	2	1	1	300	PE
M3110051	Intellectual Property Rights	2	1	1	300	OE
M3110010	Mini-Project and Internship	3	0	3	300	PE
M3110011	Digital Chip Design and Verification	3	0	3	300	PE
M3110013	Sparse signals and Compressed Sensing	3	1	2	300	PE
M3110015	AI System Analysis and Design lab	3	1	2	300	PE
M3110019	NEMS/MEMS Systems lab	3	1	2	300	PE
M3110021	Signal Decomposition and Recovery lab	3	0	3	300	PE
M3110023	Robotics and Industrial Automation 4.0 lab	3	1	2	300	PE
M3110025	Quantum Computers and Applications	3	1	2	300	PE
M3110027	Machine Learning at the Edge on Arm	3	1	2	300	PE
M3110028	Embedded Systems Essentials with Arm 2	3	1	2	300	PE
M3110029	Introduction to System on Chip Design	3	1	2	300	PE

4.2.3 Semester 3

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M4110001	Research Topics in Electronics Engineering	12	0	12	400	OE
M3110032	Embedded Linux	3	0	3	300	OE
M3110033	Advanced System on Chip Design	3	0	3	300	OE

4.2.4 Semester 4

Course Code	Course Name	Total Credits	Interactive	Practicals	Course Level	Course Type
M4110002	Thesis	15	0	15	400	P
M4110003	Research Paper	3	0	3	500	OE

BOARD OF STUDIES

5.1 MEMBER LIST (2023-24)

1. Bhaskar Choubey, Chair Professor, Seigen University
2. Deepu John, Assistant Professor, University College Dublin
3. Rajesh Panicker, Senior Lecturer, National University of Singapore
4. Rahul Nair, Professor, University of Manchester
5. Paul Kollanoor Ittoopunny, Principal Engineer - IC Design at Broadcom
6. Krishna Kanth, Director, OSRAM-AMS
7. Javed G S, Technical Lead, Intel
8. Sreelal S, Scientist G, ISRO
9. Jai Tripathi, Assistant Professor, IIT Jodhpur
10. Asharaf S, Professor, SoCSE, Digital University Kerala
11. Elangovan K, Assistant Professor, SoESA, Digital University Kerala
12. Muthusankar Eswaran, Assistant Professor, SoESA, Digital University Kerala
13. Sumit Datta, Assistant Professor, SoESA, Digital University Kerala
14. Christie Thomas, Assistant Professor, SoESA, Digital University Kerala
15. Jose Joseph, SoESA, Assistant Professor, Digital University Kerala (Committee Convener)
16. Alex James, Professor, SoESA, Digital University Kerala (Committee Chair)