# BTech in Electronics Engineering (VLSI DESIGN and TECHNOLOGY)
## New Curriculum Semester-wise Schema

| First Semester | | Second Semester | |
|---|---|---|---|
| **Course Name** | **Cr** | **Course Name** | **Cr** |
| Engineering Chemistry & Lab | 3 | Engineering Physics & Lab | 4 |
| Calculus & Matrices | 3 | Computational Mathematics | 3 |
| Basic Electrical Engineering | 3 | Environmental Studies | 2 |
| Basic Electronics | 3 | Engineering Materials & Mechanics | 4 |
| Biology for Engineers | 2 | Matlab for Engineers | 2 |
| Computer Programming & Lab | 4 | Creativity & Innovation Lab | 2 |
| IoT Fab Lab | 1 | Engineering Graphics | 1 |
| Constitution of India | 1 | Technical Writing Clinic 1 | 1 |
| | | Universal Human Values | 1 |
| **First Semester Credits** | **20** | **Second Semester Credits** | **20** |

| Third Semester | | Fourth Semester | |
|---|---|---|---|
| **Course Name** | **Cr** | **Course Name** | **Cr** |
| Statistics & Probability | 3 | Management | 3 |
| Network, Signals & Systems | 4 | Semiconductor Device Fabrication | 4 |
| Analog Circuits & Systems | 4 | Computer Architecture | 4 |
| Digital System Design | 4 | Flexi Core 1 | 4 |
| Economics | 3 | Program Elective 1 | 3 |
| University Elective 1 | 3 | University Elective 2 | 3 |
| Lab 1 | 1 | Lab 3 | 1 |
| Lab 2 | 1 | Lab 4 | 1 |
| Self-Study or Project | 1 | Project Based Learning 1 | 1 |
| **Third Semester Credits** | **24** | **Fourth Semester Credits** | **24** |

| Fifth Semester | | Sixth Semester | |
|---|---|---|---|
| **Course Name** | **Cr** | **Course Name** | **Cr** |
| MOS VLSI Design | 4 | VLSI Design with Verilog HDL | 4 |
| Modern Communication System | 4 | Flexi Core 3 | 4 |
| Flexi Core 2 | 4 | Program Elective 4 | 3 |
| Program Elective 2 | 3 | Program Elective 5 | 3 |
| Program Elective 3 | 3 | University Elective 4 | 3 |
| University Elective 3 | 3 | Technical Writing Clinic 2 | 1 |
| Lab 5 | 1 | Lab 7 | 1 |
| Lab 6 | 1 | Lab 8 | 1 |
| Project Based Learning 2 | 1 | Research, Innovation & Entrepreneurship | 3 |
| **Fifth Semester Credits** | **24** | **Fourth Semester Credits** | **23** |

| Seventh Semester | | Eighth Semester | |
|---|---|---|---|
| **Course Name** | **Cr** | **Course Name** | **Cr** |
| University Elective 5 | 3 | Major Project | 12 |
| Program Elective 6 | 3 | | |
| Program Elective 7 | 3 | | |
| Program Elec 8 / Univ Elect 6 | 3 | | |
| Internship (Industry/ Research) | 1 | | |
| **Fifth Semester Credits** | **13** | **Eighth Semester Credits** | **12** |

Key Phrases and Expectations in the New Curriculum Schema in MUJ Faculty of Engineering (FOE):

**Department Core (DC) Courses:** Fundamental courses for the program of study. Mandatory for all students in the program. Each program has eleven departmental core courses of 4 credits each and 8 labs of 1 credit each for a total of 40 credits. Departments can shuffle the credits and labs or develop integrated didactic and laboratory courses.

**Flexi Core (FC) Courses:** Core Courses based on emerging trends in the field. Students have the opportunity to select three FCs (4Cr x 3) from a bucket offered during the fourth, fifth or sixth semester for a total of 12 Credits.

**Program Electives (PE):** Departments will offer a set of program specific elective courses for each semester. Students have the flexibility to select PEs from all Faculty of Engineering departments. For example, a student from Civil Engineering can study PEs offered by the Department of Computer Science and Engineering. Students will be responsible for completing the prerequisites from other department courses as online value-added courses. No additional credit is offered for these pre-requisite courses taken online or value-added courses.

- **Industry Expert Courses:** Selected few Program Electives will be jointly developed by FOE faculty and industry experts, introducing the latest learnings from industry. In these courses, one or more industry experts may conduct a significant portion (> 50%) of the course. These courses will be marked with an IEC in our Course Catalog.

**University Electives (UE):** These are graded, open elective courses offered across the University. This is an opportunity for our students to expand their knowledge base and learn topics in non-engineering domains. FOE students cannot take FOE offered UEs.

**Focus Areas:** Focus Areas provide students an opportunity to study and develop expertise in any University discipline. Focus Areas are offered within FOE departments and across the University.

- For Focus Areas, students need to take four courses from a pre-selected bucket of six plus Program Electives from across FOE. For example, a Mechanical Engineering student can put together four PEs and attain a Focus Area in: Blockchain, Cybersecurity, Robotics, AI/ML, Electrical Vehicle Technology, or any other are of their interest.
- Similarly, Focus Areas are also available University-wide by taking four courses from a pre-selected bucket of six plus University Electives. For students pursuing a Focus Area outside of Engineering, they can substitute PE8 for a sixth University Elective in the Seventh Semester.

**Self-Study Courses; Problem Based Learning; Research Innovation and Entrepreneurship:** These courses offered in the third through sixth semester offer students an opportunity to enhance their academic curricula with learning new skills, taking online classes, conducting guided research projects or developing innovative solutions to societal problems.

In a **Self-Study Course,** students have the opportunity to learn a new skill or computer programming language in Online mode. Producing a completion certificate and a brief assessment with a guide is necessary to receive a grade and credit.

Problem

**Research Innovation and Entrepreneurship (RIE):** In this course, students can pursue a broader research investigation, innovation or a startup. The expected outcome is a research paper presented at a conference, a paper publication, a patent application for an innovation or launching a startup.

**Proposed List of Courses offered by the Department of Electronics and Communication Engineering for B.Tech. Electronics Engineering (VLSI Design and Technology)**

*1.Proposed Flexi- Courses*

1. FC1: Data Structures and Algorithms
2. FC1: VLSI Signal Processing

3. FC2: FPGA Architecture
4. FC2: Embedded Systems

5. FC3: Machine Learning in VLSI
6. FC3: VLSI Physical Design

*2.Proposed Department Program Electives*

**(PE1)**

1.      Electromagnetic Interference & Compatibility
2.      Semiconductor Device Modelling
3.      Microcontrollers & its applications

**(PE2)**
1.      Error Control Coding Techniques
2.      MEMS Sensors & Technology
3.      Nano & Opto materials
4.      Computer Vision & Image Processing

**(PE3)**

1.      ARM System Development
2.      VLSI DSP Architectures
3.      Neural Network & Deep learning

4.      Nanodevices & Circuit Design

**(PE4)**

1.      Synthesis and Optimization of Digital Circuit
2.      VLSI wireless communication
3.      Semiconductor manufacturing & Packaging
4.      Analog VLSI Design

**(PE5)**

1.      Optical Sensors
2.      VLSI Interconnects
3.      VLSI Testing & Testability
4.      Analog VLSI Design

**(PE6)**

1.      Low Power VLSI Design
2.      Display technologies and manufacturing
3.      Memory Technology and Neuromorphic Computing
4.      Static Timing Analysis

**(PE7)**

1.      System Verilog for Design & Verification
2.      Mixed Signal IC Design
3.      Advanced Semiconductor Devices and Flexible Electronics
4.      Hardware Security

**(PE8)**

1.      High Speed IC Design
2.      Semiconductor Memory Design
3.      Advance Computer Architecture & Processor Design
4.      Advance VLSI and SoC Design

*3.Focus Areas offered by Department of Electronics and Communications*

Testing and Verification:
1.      VLSI Testing & Testability
2.      System Verilog for Design & Verification
3.      Static Timing Analysis
4.      Advance Computer Architecture & Processor Design

Physical Design:
1.      Analog VLSI Design
2.      Low Power VLSI Design
3.      Mixed Signal IC design
4.      Semiconductor Memory Design

*4.Proposed Department University Electives:*

1. *Introduction to Communication Systems*
2. *Sensors*
3. *Mobile cellular communication*
    *Introduction to game theory*
4. *Excel fundamentals for data analysis*
5. *Stress free living(in collaboration with MUJ YES+ Chapter, faculty from Art of living)*
6. *Shrimad Bhagwad Gita (in collaboration with Abhigya Club & faculty from Akshaypatra foundation)*
7. *Mobility management-land, water and sea*
8. *Engineering in medicine & biology*
9. *Power & energy for societal development*