

Indian Institute of Technology, Kanpur
Department of Electrical Engineering

Proposal for a New Course

1. Course No: **EE4xx**
2. Course Title: **Microprocessor Architectures & Applications**
3. Per Week Lectures: **3** (L), Tutorial: **0** (T), Laboratory: **0** (P), Additional Hours [0-2]: **0** (A)
 - Credits (3*L+2*T+P+A): **9**
 - Duration of Course: **Full Semester**
4. Proposing Department/IDP: **Electrical Engineering**
 - Other Departments/IDPs which may be interested in the proposed course: **CSE, BSBE**
 - Other faculty members interested in teaching the proposed course: Chithra, Y. N. Singh, Tushar Sandhan, Nagarjuna Nallam, Swamy Peruru, Koteswar Rao Jerripothula, R S Ashwin, Vipul Arora, Washim Mondal
5. Proposing Instructor(s): **Prof. Nikunj Bhagat (EE), Prof. Debapriya Basu Roy (CSE)**
6. **Pre-requisites: EE370**
7. **Course Description:**

This course will introduce students to fundamentals of microprocessor and microcontroller architectures (ARM, RISC, etc.), instruction sets, pipelining, memories. Students will learn to implement basic computational algorithms using the open-source RISC-V architecture on FPGAs. Topics relevant for developing embedded system applications such as interrupts, peripheral interface protocols, RTOS, etc. will also be covered with the help of case studies.
8. **Contents:**

S. No.	Topics	No. of Lectures
1.	Processor basics, MIPS, ARM, RISC	4
2.	Floating number representation, multiplier, division	4
3.	Introduction to instruction sets, pipelining	4
4.	RISC-V architecture basics, OpenTitan	8
5.	Microcontroller Architecture (8051, PIC, ARM-M0)	4
6.	Interrupts	4
7.	Interface Communication Protocols - UART, SPI, I2C, CAN	6
8.	Case study (e.g. sensor interfacing, vehicle communication)	4
9.	Concepts of Scheduling, RTOS	2

7. **Recommended Books: Textbooks, Reference books**
 - Computer Organization and Design: The Hardware/Software Interface, David A Patterson, John L. Hennessy, 4th Edition, Morgan Kaufmann, 2009
 - Computer Organization and Design RISC-V Edition, David Patterson, 2017.
 - The 8051 Microcontroller, 3rd Edition, Kenneth Ayala, 2004
 - PIC Microcontrollers – Programming in C, Milan Verle
 - The Definitive Guide to the ARM Cortex-M0, Joseph Yiu, 2011
 - Books related to HDL (Verilog, VHDL, BSV) programming.

Dated: 24-03-2026

Proposer: Nikunj Bhagat, Debapriya Roy

Dated: _____

DPGC Convener: _____

The course is approved/not approved.

Chair, SPGC

Dated: _____