BML Munjal University
A Hero GROUP INITIATIVE

SCHOOL OF ENGINEERING & TECHNOLOGY

COURSE FILE

Program: Electronics and Computer Engineering
Course Code: ECE3009
Course Title: IoT Sensors, Peripherals and Processors
Module Semester: Vth Sem
Session: 2024-25

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15.	Interventions made for slow performers and advanced learners, highlighting initiatives taken for student improvements (retest, resubmissions etc.)
16.	End Semester Question papers with sample solutions
17.	Details of Marks in all components up to the End Semester including the grades
18.	Identification of advanced learners and low performers conducted at the end of the semester
19.	Attendance Report
20.	CO attainment analysis with the reflection on feedback on course outcomes
21.	Feedback (class committee or otherwise) and corrective actions (if any)
22.	Faculty Course Review (if any, like Use of Innovative Pedagogies; Technology; Experiential Learning; Integration with the Vision and Mission of the University; Feedback; Course Outcome attainment for the next run of the course)
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1. Course Details

- **Course Code:** ECE3009
- **Course Title:** IoT Sensors, Peripherals and Processors
- **Module/Semester: Vth Sem**
- **Session:** 2024-25

2. Vision, Mission of the University

Vision

BML Munjal University seeks to nurture ethical leaders who are skilled, knowledgeable and have the life skills required for leading their organizations to success. The university shall seek the advancement and dissemination of practically oriented knowledge benchmarked with the best global standards.

Mission

BML Munjal University aims to be a leading university for the quality and impact of its teaching, research and linkages with major stakeholders. The focus of the university is to find creative solutions to problems through application of knowledge. The university aims to create a talented community of students and faculty who excel in teaching, learning and research, in a creative and stimulating environment. The university will collaborate with other institutions for development of science, technology and arts in the global context.

3. Graduate Attributes

- Acquire and apply practical understanding of discipline knowledge.
- Demonstrate a sense of ethics and display excellence in both personal and professional life.
- Exhibit problem solving, critical thinking skills and investigative capability to address real world problems.
- Manifest leadership qualities and work effectively in teams across globally diverse environments.
- Be a lifelong learner with an entrepreneurial mindset to innovate in the constantly changing global scenario.
- Possess a strong sense of inquiry and design innovative solutions for positive societal impact.
- Be effective communicators and possess an empathetic outlook.

4. Vision, Mission of the School

Vision of School:

To be amongst the leading engineering schools of the country recognized globally for excellence in teaching and research with focus on experiential learning, innovation and entrepreneurship.

Mission of School:

* Providing high-quality learning experience to our students, preparing them to be global leaders, and contributing to the development of society through research, innovation, and entrepreneurship.
* Creating an inclusive and diverse learning environment that fosters creativity, critical thinking, and ethical values.
* Collaborating with industry, government, and other institutions to address complex societal challenges and promote sustainable development.

5. PEOs and POs & PSOs of the Program

Program Educational Objectives (PEO):

PEO1: Understand, analyze, design, test and create prototypes for a) Modern electronic circuits & systems; and b) digital & analog systems.

PEO2: Demonstrate multidisciplinary knowledge to interface and embedded electronics & computer science in a) analyzing, designing, testing and prototyping of engineering solutions; and b) Systems Integration.

PEO3: Demonstrate capability for creativity, innovation, design thinking and entrepreneurship.

PEO4: Demonstrate and apply ethical and professional practices in profession and work responsibly towards social welfare, environmental sustainability and Job Creation / enrichment.

Program Outcomes (PO):

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, along with Electronics & Computer engineering to the solution of complex engineering problems.

PO2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using domain knowledge of electronics & computer engineering.

PO3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health & safety, cultural, societal, and environmental considerations.

PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Select and apply appropriate techniques, resources, and electronics & communication engineering tools to various engineering activities with an understanding of the limitations.

PO6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Demonstrate knowledge and understanding of the electronics & computer engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO):

PSO1: Analyze and create engineering solutions for Inter-disciplinary problems and assess the impact in Global, Economic, Environmental, and Societal context.

PSO2: Design, develop and test modern electronic systems to derive solutions to real world problems using cutting edge hardware and software tools.

6. Course Description and its objectives

Sensors and microcontrollers are the key to automate and incorporate intelligence in automatic systems which are used for real time operations. Therefore, it is mandatory to develop a good understanding of their operation and how they can be used as building blocks for automated systems and control applications. This course explores the inner workings of a microcontroller from the programmer's perspective for which the course is divided into three main sections; (a) Introduction to sensors, their signal conditioning and actuators (b) Microcontroller embedded C programming (c) Sensors and actuator interfacing.

7. Course Outcomes and CO-PO Mapping

Course Outcomes:

CO1: Understand the fundamentals of various sensors and their signal conditioning operations.

CO2: Analyze various types of microcontroller development boards in terms of their architectures and programming.

CO3: Apply the concepts of microcontroller programming for interfacing of various sensors, actuators and other peripherals.

CO/PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	2	1	2	0	0	0	0	0	0	0	0	0
CO3	3	3	2	2	3	2	3	3	0	0	0	0	0	0

8. Detailed Session wise Plan & Course Syllabus

Sr. No.	Content	CO	Sessions
1	Introduction to various types of sensors: LDR, photo diodes, motion sensors, ultrasonic sensors, hall effect sensors, temperature and humidity sensors.	1	2
2	Sensor signal conditioning: Basics types of signal conditioning - Analog signal conditioning (Amplification, level shifting, voltage to current and current to voltage conversion and filtering) Digital signal conditioning (Noise removal, analog to digital conversion and isolation using opto- couplers)	1	2
3	Introduction to microcontrollers boards: ARDUINO NANO, ARDUINO, ESP8266, NODE MCU, ESP32, RASPBERRY PI, NVIDIA JETSON.	2	2
4	Architecture, pin diagram and features of ATMega328 microcontroller. I/O programming, Timers, watch-dog timer basics, and programming. Analog to digital convertor basics and programming in C, interfacing of temperature sensor and LDR. Interrupt programming in C.	2	3
5	Serial communication basics and programming in C: UART, I2C, and SPI. Sensors and actuators interfacing: led, push button, de-bouncing of switch and its hardware and software solution. DC, Servo, Stepper, and BLDC motor basics and interfacing.	3	4
6	PWM basics and programming in C: Fast, phase correct PWM. Analog comparator programming in C. Creating header files.	3	2

Learning Resources

Text Books:

✓ Muhammad Ali Mazidi., “AVR microcontroller and Embedded systems using assembly and C”, Prentice Hall.

✓ Richard H., “Embedded C programing and the ATMEL AVR”, Thompson Delmar learning.

Reference Links:

- The Intel ATMega 328 datasheet.
- Virtual Labs: Proteous and Tinker Cad

9. Weekly Timetable

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:15-10:10					
10:15-11:10					
11:15-12:10					
12:15-13:10					
13:15-14:10					
14:15-15:10					
15:15-16:10					
16:15-17:10					
17:15-18:10					

11. Internal Assessment Data

Component	Duration	Weightage	Evaluationweek	Remarks
Project Phase Evaluation-1		30%	Week-2/3 of September	Presentation and viva: Project proposal, literature review, methodology, preliminary results
One Quiz (Including Coursera component)		30%	Week-4 of October	Closed book
Project Phase Evaluation-2 (END-TERM)		40%	Week-3/4 of November	Project-based (Demonstration + viva + report)

13. Sample Evaluated Internal Submissions and Identification of weak students.

Learner Categories Summary for Partial Semester

Learner Category	Number of Students
Advanced Learners	0
Medium Learners	0
Low Performers	0

Student Learning Classification for Partial Semester

Student Name	Category

15. Actions taken for low performers

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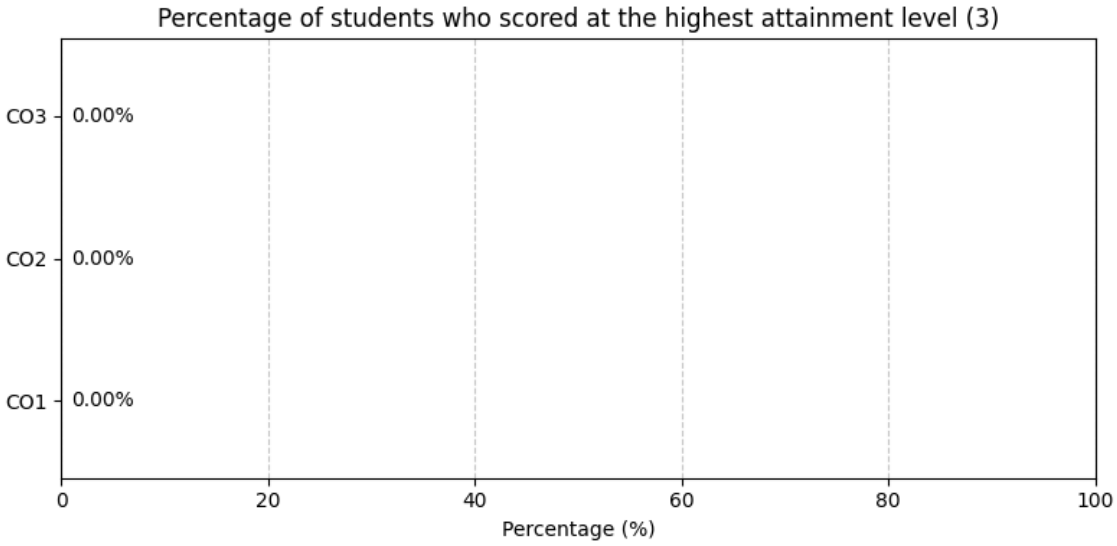
20. CO attainment analysis with the reflection on feedback on course outcomes

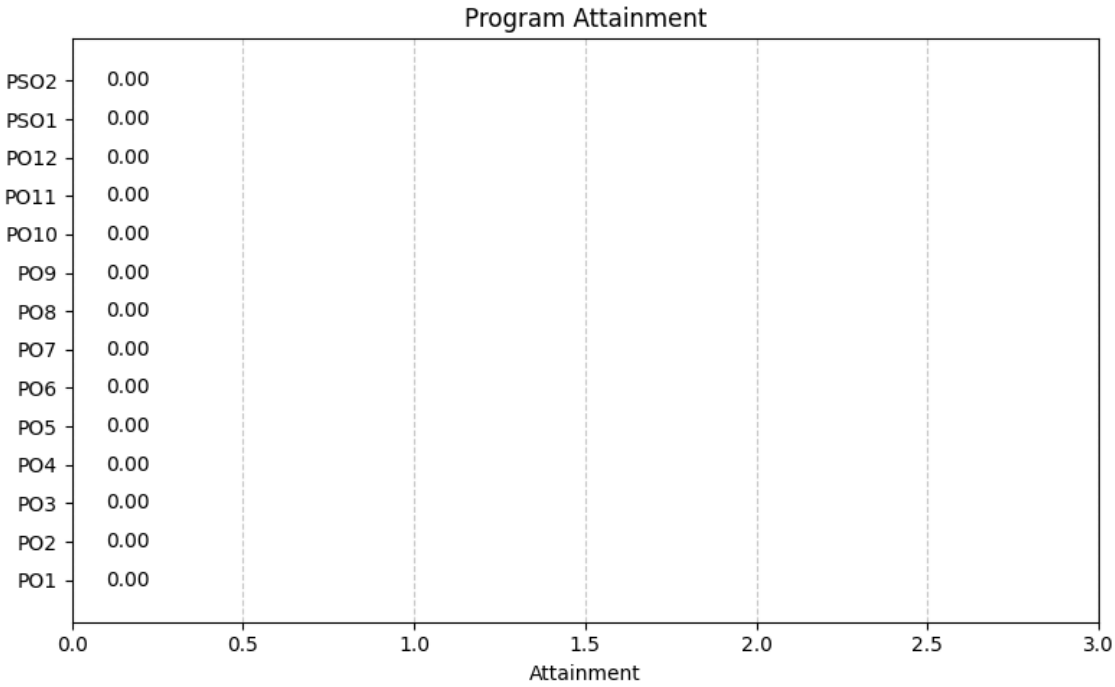
CO Attainment Summary

Course Outcomes	CO1	CO2	CO3
Weights	0.00%	0.00%	0.00%
No. of students who scored at the highest attainment level (3)	0	0	0
Percentage of students who scored at the highest attainment level (3)	0.00%	0.00%	0.00%
Attainment Level	2	2	2
Overall Course Attainment	**2.0000**		



Program Attainment

Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Program Attainment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



21. Feedback (class committee or otherwise) and corrective actions (if any)

Quantitative Feedback:

Average Rating: 0.00/5