BML MUNJAL UNIVERSITY
FROM HERE TO THE WORLD

SCHOOL OF ENGINEERING & TECHNOLOGY

COURSE FILE

Program: ECE
Course Code: ECE3009
Course Title: IoT Sensors, Peripherals and Processors
Module Semester: Vth Semester
Session: 2022

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1. Course Details

- Course Code: ECE3009
- Course Title: IoT Sensors, Peripherals and Processors
- **Module/Semester: Vth Semester**
- Session: 2022

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):

a) PEO 1: Identify real-life problems and develop creative and innovative hardware/software-based solutions.
b) PEO 2: Achieve professional development through self-learning to adapt to the technological changes in the ever changing field of computing.
c) PEO 3: Engage in life-long learning of computer engineering technologies, critical thinking and continuous ingenuity and apply them in real-life applications.
d) PEO 4: Accomplish leadership roles by imbibing ethics and professionalism with emphasis on sustainable development of the society.

Program Outcomes (PO):

e) PO1: Apply the foundational concepts of mathematics, science and computer engineering to find novel solutions for complex real-life engineering problems.
f) PO2: Identify, formulate, review literature and analyze complex computer engineering problems reaching substantiated conclusions and derive a coherent logic that can be implemented by computers.
g) PO3: Design analytical and computational models for solving complex engineering problems giving due consideration to issues related to public health and safety, cultural and societal constraints, and environmental concerns.
h) PO4: Use research-based knowledge, methods, tools and techniques for data collection, designing digital computing systems, analyzing and interpreting the results to provide substantiated conclusions.
i) PO5: Use appropriate tools to model complex computer engineering problems through identification of the limitations and creating solutions to predict the real-world phenomena.
j) PO6: Use appropriate contextual knowledge of computer engineering to review and assess societal, health, legal, cultural, safety and contemporary issues and rationalize the ensuing responsibilities towards the society.
k) PO7: Adopt computer engineering practices in congruence with societal need, understand the working practices and its impact on natural resources for sustainable development.
l) PO8: Use ethical principles to pursue excellence in developing computer engineering systems and behave appropriately to develop a reliable and trustworthy relationship with others.
m) PO9: Function effectively as a reliable and responsible individual, and as a member or leader in diverse computer engineering teams, and in multidisciplinary settings, thereby placing team goals ahead of individual interests.
n) PO10: Communicate effectively by capturing the desirable computer system requirements for preparation of specification documents, write clear and concise report such as laboratory files, research papers, thesis, and presentation materials.
o) PO11: Demonstrate knowledge of computer engineering and management principles for the completion of individual or group projects in multidisciplinary environments.
p) PO12: Recognize the evolving technological changes and engage as an independent and life-long learner in both computing and non-computing fields.

Program Specific Outcomes (PSO):

q) PSO1: Identify applicable tools and techniques related to data science practice such as data

collection, cleaning, analysis, modelling, evaluation and result interpretation and apply them for deriving hidden and meaningful patterns for appropriate actionable insights.

r) PSO2: Develop intelligent systems for various real-life domains like healthcare, transportation, finance etc. using Artificial Intelligence methodologies.

s) PSO3: Understand the foundational concepts and techniques to protect computing systems against constantly evolving cybersecurity threats and analyze security breaches and violations of cyber systems and networks to provide appropriate solutions.

t) PSO4: Design effective security systems to mitigate risks, threats and vulnerabilities for protecting the organizations against cyber threats.

6. Course Description and its objectives

The objective of course is to introduce the students to a variety of sensors, actuators and signal conditioning operations.
To understand the concepts of root level microcontroller programming in C so that they can write the customized programs for different real-world applications.

7. Course Outcomes and CO-PO Mapping

Course Outcomes:

CO1:

CO2:

CO3:

CO/PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	0	0	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	0	0
CO3	3	3	2	2	3	2	3	3	0	0	0	0	0	0	0	0

8. 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.	CO1	1
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).	CO1	1
3	Introduction to microcontrollers boards: ARDUINO NANO, ARDUINO, ESP8266, NODE MCU, ESP32, RASPBERRY PI, NVIDIA JETSON.	CO2	1
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.	CO2	1
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.	CO3	1
6	PWM basics and programming in C: Fast, phase correct PWM. Analog comparator programming in C. Creating header files.	CO3	1

9. 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

10. Weekly Timetable

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:15-10:10	IoT Sensors, Peripherals and Processors (ECE3009)				
10:15-11:10		IoT Sensors, Peripherals and Processors (ECE3009)			
11:15-12:10			IoT Sensors, Peripherals and Processors (ECE3009)		
12:15-13:10				IoT Sensors, Peripherals and Processors (ECE3009)	
13:15-14:10					IoT Sensors, Peripherals and Processors (ECE3009)
14:15-15:10				IoT Sensors, Peripherals and Processors (ECE3009)	
15:15-16:10			IoT Sensors, Peripherals and Processors (ECE3009)		
16:15-17:10		IoT Sensors, Peripherals and Processors (ECE3009)			
17:15-18:10	IoT Sensors, Peripherals and Processors (ECE3009)				

11. Registered Students List

Sr. No.	Roll No	Student Name	Unique Id
1	220C2030001	Aditya Goel	240334
2	220C2030002	Anisha Chhanpadia	240335
3	220C2030003	Dhruv Singla	240336
4	220C2030004	Dorjee Phinjo Sona	240337
5	220C2030005	EENA CHAUDHARY	240338
6	220C2030006	Eshaan Chandra	240339
7	220C2030007	Hardik Rustagi	240340
8	220C2030008	Harsh Gupta	240341
9	220C2030009	Jiya Gera	240342
10	220C2030010	Keshav Gupta	240343
11	220C2030011	Luvisha Verma	240345
12	220C2030012	Mehal Raghav	240346
13	220C2030013	Neha Raju Shinde	240347
14	220C2030014	Priya Chadda	240348
15	220C2030015	Purnendu Vashishtha	240349
16	220C2030016	Sagar Bista	240350
17	220C2030017	Shoryaveer Singh	240351
18	220C2030018	Yash Garg	240352
19	220C2030019	Sanchi Narang	240870
20	220C2030020	Cheshtha Narang	240871
21	220C2030021	Nishtha Arora	240909
22	220C2030022	Astha Jaiswal	240794
23	220C2030023	Kshitij Khera	240333
24	220C2030024	Hitansh Goel	240943
25	220C2030025	Sneha Singh	240963

19. Attendance Report

Sr. No.	Roll No	Student Name	Attendance Out of(100)
1	220C2030001	Aditya Goel	75.00
2	220C2030002	Anisha Chhanpadia	85.19
3	220C2030003	Dhruv Singla	71.43
4	220C2030004	Dorjee Phinjo Sona	89.29
5	220C2030005	EENA CHAUDHARY	100.00
6	220C2030006	Eshaan Chandra	85.71
7	220C2030007	Hardik Rustagi	78.57
8	220C2030008	Harsh Gupta	82.14
9	220C2030009	Jiya Gera	92.86
10	220C2030010	Keshav Gupta	75.00
11	220C2030011	Luvisha Verma	92.86
12	220C2030012	Mehal Raghav	81.48
13	220C2030013	Neha Raju Shinde	89.29
14	220C2030014	Priya Chadda	85.19
15	220C2030015	Purnendu Vashishtha	96.43
16	220C2030016	Sagar Bista	96.43
17	220C2030017	Shoryaveer Singh	60.71
18	220C2030018	Yash Garg	71.43
19	220C2030019	Sanchi Narang	96.43
20	220C2030020	Cheshtha Narang	96.43
21	220C2030021	Nishtha Arora	100.00
22	220C2030022	Astha Jaiswal	42.86
23	220C2030023	Kshitij Khera	78.57
24	220C2030024	Hitansh Goel	82.14
25	220C2030025	Sneha Singh	82.14

18, 20 Detail of Marks in all components up to the End Semester

Sr. No.	Roll No	Student Name	Assignment Out	End term examination Out	Group Presentation Out	Individual Class Participation Out	Mid Term Exam Out	Role Play Out	Total Marks(100.0) Out
1	220C2030001	Aditya Goel	8.5	0.0	9.0	0.0	6.5	8.0	32.00
2	220C2030002	Anisha Chhanpadia	8.5	21.0	9.0	9.0	10.5	8.0	66.00
3	220C2030003	Dhruv Singla	8.5	24.0	9.0	1.0	6.0	8.0	56.50
4	220C2030004	Dorjee Phinjo Sona	8.5	18.5	9.0	7.0	3.0	8.0	54.00
5	220C2030005	EENA CHAUDHARY	9.0	29.0	9.0	8.5	8.0	8.0	71.50
6	220C2030006	Eshaan Chandra	7.5	26.0	8.5	6.0	8.0	7.5	63.50
7	220C2030007	Hardik Rustagi	9.0	21.0	8.5	7.5	4.5	7.5	58.00
8	220C2030008	Harsh Gupta	8.0	20.0	7.5	0.0	7.5	8.0	51.00
9	220C2030009	Jiya Gera	8.5	26.5	8.5	7.5	8.5	8.0	67.50
10	220C2030010	Keshav Gupta	7.5	5.0	8.5	0.0	4.0	8.0	33.00
11	220C2030011	Luvisha Verma	8.0	20.0	7.5	9.5	7.5	7.0	59.50
12	220C2030012	Mehal Raghav	8.0	30.0	7.5	3.0	4.0	7.0	59.50
13	220C2030013	Neha Raju Shinde	8.5	20.5	8.5	6.0	6.0	7.5	57.00
14	220C2030014	Priya Chadda	9.0	34.0	8.5	6.5	16.0	8.0	82.00
15	220C2030015	Purnendu Vashishtha	8.0	11.5	8.0	6.5	8.0	7.0	49.00
16	220C2030016	Sagar Bista	9.5	23.0	8.0	7.5	12.0	7.0	67.00
17	220C2030017	Shoryaveer Singh	8.0	21.5	0.0	1.0	2.5	7.0	40.00
18	220C2030018	Yash Garg	8.0	5.0	7.0	0.0	2.5	8.0	30.50
19	220C2030019	Sanchi Narang	9.5	35.0	8.0	9.5	17.0	8.0	87.00
20	220C2030020	Cheshtha Narang	7.5	33.0	9.0	9.5	8.0	8.0	75.00
21	220C2030021	Nishtha Arora	8.5	18.5	7.5	8.5	17.5	8.0	68.50
22	220C2030022	Astha Jaiswal	0.0	0.0	0.0	0.0	0.0	0.0	0.00
23	220C2030023	Kshitij Khera	9.5	15.5	7.5	4.5	8.5	7.0	52.50
24	220C2030024	Hitansh Goel	8.0	11.5	7.5	4.0	3.5	8.0	42.50
25	220C2030025	Sneha Singh	8.0	26.5	8.0	5.5	9.5	8.0	65.50

12. CO Attainment Analysis

CO Attainment Summary

Course Outcomes	CO1	CO2	CO3
Weights	20.00%	60.00%	20.00%
No. of students scored greater than 3	11	2	20
Percentage of students scored greater than 3	44.00%	8.00%	80.00%
Attainment Level	1	1	3
Overall Course Attainment	**1.6667**		

Program Attainment

Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Program Attainment	2.12	2.21	2.11	2.25	2.22	2.72	2.72	2.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Student-wise CO Achievement

NAME	CO1 Score	CO2 Score	CO3 Score
Aditya Goel	1	1	3
Anisha Chhanpadia	3	1	3
Dhruv Singla	1	1	3
Dorjee Phinjo Sona	3	1	3
EENA CHAUDHARY	3	2	3
Eshaan Chandra	2	2	3
Hardik Rustagi	3	1	3
Harsh Gupta	1	1	3
Jiya Gera	3	2	3
Keshav Gupta	1	1	3
Luvisha Verma	3	1	2
Mehal Raghav	2	2	2
Neha Raju Shinde	2	1	3
Priya Chadda	3	3	3
Purnendu Vashishtha	2	1	3
Sagar Bista	3	2	3
Shoryaveer Singh	1	1	1
Yash Garg	1	1	3
Sanchi Narang	3	3	3
Cheshtha Narang	3	2	3
Nishtha Arora	3	2	3
Astha Jaiswal	1	1	1
Kshitij Khera	2	1	2
Hitansh Goel	2	1	3
Sneha Singh	2	2	3
Average	**2.16**	**1.48**	**2.72**

14. Actions taken for weak students

- we kill then no weak students no action required for weak students