TUP MISSION

The Technological University of the Philippines shall provide higher and advanced vocational, technical, industrial, technological, and professional education and training in industries and technology and in practical arts leading to applied research, certificates, diplomas, and degrees. It shall provide progressive leadership in developmental studies in technical, industrial, and technological fields and production using indigenous materials, effect technology transfer in the countryside; and assist in the development of small and medium scale industries in identified growth-centers.

TUP VISION

The Technological University of the Philippines shall be the premier state university with recognized excellence in engineering and technology education at par with the leading universities in the ASEAN Region.

TUP CORE VALUES

T- transparent and participatory governance
U- unity and cooperation in the pursuit of TUP mission, goals, and objectives
P- professionalism in the discharge
I- integrity and consistent commitment to maintain the good name of the University.
A-accountability for individual and organizational quality performance
N- nationalism through tangible contribution to the rapid economic growth of the country
S- shared responsibility, hard work, and resourcefulness in compliance to the national mandates

COLLEGE GOALS

1. To produce quality engineers and technologies equipped with proper values, knowledge and skills relevant to the changing needs and conditions;
2. To provide continuing graduate education to engineers who wish to pursue higher and advanced learning in their field of specialization;
3. To produce valuable research outputs and render quality extension services in various areas of engineering technology.

PROGRAM DESCRIPTION

Bachelor of Engineering Technology Major in Electronics/Communication/Computer

PROGRAM EDUCATIONAL OBJECTIVES

After 4 years of study, the graduates of the program are expected to:

1. Embark on gainful and meaningful careers of personal and professional growth as computer/ electronics/ telecommunications engineering technologists.
2. Pursue in life-long learning activity such as progressive leadership in applied research, development studies in technical, industrial and engineering technology fields and production.
3. Engage in professional services to effect technology transfer and assist in the development of small and medium scale industries to contribute to national development.

COURSE TITLE/NAME: Microprocessors and Microcontrollers
COURSE CODE/NUMBER: **CPET 11**
PRE-REQUISITE: **CPET 9/ 9L**
CO-REQUISITE: **NONE**
NO. OF UNITS/HRS. PER WEEK: **3 UNITS/ 3 HRS PER WEEK**

COURSE DESCRIPTION

This course provides an understanding of various concepts, theories, principles, trends, architectures, and operations of microprocessor and microcontroller-based systems, including their design and operational similarities and differences. It also includes the discussion of a specific sample of a microcontroller unit, its organization, electrical/physical characteristics, instruction set, programming language, and integrated development tools. At the end of the course, the students are expected to grasp the application of a microcontroller unit through a research-based case study.

PROGRAM OUTCOMES AND ITS RELATIONSHIP TO PROGRAM EDUCATIONAL OBJECTIVES

Program Outcomes		Program Educational Objectives		
		1	2	3
(a)	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to define and apply engineering procedures, processes, system and methodologies.	✓	✓	
(b)	Identify, formulate, research literature, and analyze broadly defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialization.	✓	✓	
(c)	Design solutions for broadly defined engineering technology problems and contribute to the design of system components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, social, and environmental considerations.		✓	✓
(d)	Conduct investigations of broadly defined problems; locate search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions.	✓	✓	
(e)	Select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to broadly defined engineering activities, with an understanding of the limitations.	✓	✓	
(f)	Function effectively as an individual and as a member or leader in diverse technical teams.	✓	✓	
(g)	Communicate effectively on broadly defined engineering activities with the engineering community and with society at large, by being able to comprehend and write effectively reports and design documentation, make effective presentation, and give and receive clear instruction.			✓
(h)	Demonstrate understanding of the societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to engineering technology practice.			✓
(i)	Understand and commit to professional ethics and responsibilities and norms to engineering technology practice.	✓		
(j)	Understand the impact of engineering technology solutions in societal and environmental context and demonstrate knowledge of need and need of sustainable development.			✓
(k)	Demonstrate awareness and understanding of management and business practices such as risk and change management and understanding their limitations.	✓	✓	
(l)	Recognize the need for and can engage in independent and life-long learning in specialist technologies.	✓	✓	

COURSE LEARNING OUTCOMES (CLO) IN RELATIONSHIP TO PROGRAM OUTCOMES

After completing the course, the students should be able to:

Course Learning Outcomes (CLO)		Program Outcomes											
		a	b	c	d	e	f	g	h	i	j	k	l
1	Understand the different concepts, theories, principles, trends, architectures, and operations of a microprocessor and microcontroller-based system.	✓			✓	✓	✓	✓			✓		✓
2	Comprehend the nature of a microcontroller unit – its organization, characteristics, instruction set, programming language, and integrated development tools.	✓		✓	✓	✓	✓	✓			✓		✓
3	Conduct a research-based case study on the specific application of a microcontroller unit.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

COURSE LEARNING PLAN

Week	Course Learning Outcomes (CLO)	Topics	Teaching-Learning Activities (TLA)	Assessment Tasks/ Methods	Mode of Delivery
1	N/A	Orientation	-	-	Online
2-3		Module 1 - Introduction to Microprocessors and Microcontrollers	Lecture, group work	Recitation, group checkpoint activity	Hybrid learning
4-5		Module 2 - Arduino UNO MCU Overview	Lecture, group work	Recitation, group checkpoint activity	Hybrid learning
6-7		Module 3 - Programming and Simulating Arduino UNO	Lecture, simulation, group work presentation	Recitation, group checkpoint activity	Hybrid learning
8-9		Module 4 - Peripheral system design 1 (regulated power supply)	Lecture, group work, presentation	Recitation, group checkpoint activity	Hybrid learning
10-11		Module 5 - Peripheral system design 2 (relay drivers)	Lecture, group work, presentation	Recitation, group checkpoint activity	Hybrid learning
12-13		Module 6 - Interfacing Arduino UNO with sensors and motors	Lecture, simulation, group work presentation	Recitation, group checkpoint activity	Hybrid learning

14-16		Module 7 - Microcontroller application case study a. Problem b. Objectives c. Related literature d. Methodology - Design, Program e. Simulation f. Proof of concept	Lecture, simulation, group work Presentation	Group checkpoint activity	Hybrid learning
17		Final presentation	Oral defense	Evaluation rubrics	Hybrid learning
18		Final exam	-	Exam	Online

COURSE REQUIREMENTS AND GRADING SYSTEM

Attendance	10%
Teaching-Learning Activities (Group activities, simulation, other requirements, etc.)	20%
Project (Case study report, presentation, simulation/ proof of concept)	30%
Major Exams (Final exam)	30%
Peer evaluation	10%
Total	100%

Grade	Percentage Equivalent	Descriptive Rating
1.00	99-100	Excellent
1.25	96-98	Very Superior
1.50	93-95	Superior
1.75	90-92	High Average
2.00	87-89	Average
2.25	84-86	Low Average
2.50	81-83	Satisfactory
2.75	78-80	Fair
3.00	75-77	Passed
5.00	74 and Below	Failed
UD	N/A	Unofficially Dropped
OD	N/A	Officially Dropped

LEARNING RESOURCES AND SUPPORT STRUCTURE

Course syllabus, reference books, e-books, online research databases, guidelines, standards, online research communities, etc.

COURSE POLICIES/GUIDELINES

- Attend scheduled classes on time. You can be absent from the class maximum of 3 times only. For group activities, document your meeting IN and OUT through screenshots in your respective group channels.
- Ideally, 50% of the course schedules shall be conducted on-site while the remaining 50% shall be conducted using flexible methods. However, in cases of unavailable classrooms, lectures can be conducted via hybrid method – in which 50% of the class size is online while the other 50% is on-site.
- Always observe proper health protocols required by the university and higher authorities, such as wearing face masks, PPEs, and social distancing, as necessary.

- Submit requirements within 1 week, unless, otherwise specified. Late submissions are not allowed.
- Upload soft copies of requirements in the standard repositories (i.e., MS Teams and/or Google Drive) and submit pertinent hard copies to the Professor.
- Ensure full compliance with all university policies, graduate program manual, and research ethics guidelines.
- For online classes
    - Always inform your whereabouts using various applications such as MS Team, Facebook Messenger, email, etc.
    - Find your best effort to connect/reconnect online.
    - Recording is **not allowed** without an explicit permission by the Professor per RA 10175 and RA 10173.
    - You will be required to open your camera to check attendance.
    - Mute when not being called or not supposed to talk.
    - Dress appropriately.
    - Comply with the research ethics guidelines.
    - Follow consistently the requirements of TUP Order No. 30, s. 2020. Revised Guidelines on the Conduct of Online Classes in the University

REFERENCES

Barrett, S. F., & Pack, D. J. (2022). *Microcontrollers fundamentals for engineers and scientists*. Springer Nature.

Barrett, S. F. (2020). *Arduino I: getting started*. Morgan & Claypool Publishers.

Barrett, S. F. (2022). *Arduino II: systems*. Springer Nature.

Yadav, D. S. (2004). *Microcontroller: features and applications*. New Age International.