



**POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**



**Polytechnic University of the Philippines
COLLEGE OF ENGINEERING
DEPARTMENT COMPUTER ENGINEERING**

Vision

Clearing the paths while laying new foundations to transform the Polytechnic University of the Philippines into an epistemic community.

Mission

Reflective of the great emphasis being given by the country's leadership aimed at providing appropriate attention to the alleviation of the plight of the poor, the development of the citizens, and of the national economy to become globally competitive, the University shall commit its academic resources and manpower to achieve its goals through:

- o Provision of undergraduate and graduate education which meet international standards of quality and excellence;
- o Generation and transmission of knowledge in the broad range of disciplines relevant and responsive to the dynamically changing domestic and international environment;
- o Provision of more equitable access to higher education opportunities to deserving and qualified Filipinos; and
- o Optimization, through efficiency and effectiveness, of social, institutional, and individual returns and benefits derived from the utilization of 8 higher education resources.

Goals

1. Provide quality education through instruction, advance research and extension services.
2. Produce world-class professionals as potential industry leaders and job providers.
3. Develop and produce facilities through the use of adapted technology and indigenous materials.
4. Maintain, upgrade or improve facilities through the applications of engineering technology.

Objectives

1. Strengthen the Bachelor of Science in Computer Engineering program consistent with global trends;
2. Develop the critical thinking and communication skills of students, giving emphasis to research and extension services;
3. Enhance the competencies of students to evaluate, assess, design and operate safe, effective, economically-efficient and environmental friendly computer-based system;
4. create a conducive teaching and learning atmosphere with emphasis to Bachelor of Science in Computer Engineering faculty and students' growth and academic freedom;
5. establish network with educational institutions, Industries, GO's and NGO's, local and international, which could serve as:
 - a. Funding sources and/or partners of researches;
 - b. Sources of new technology;
 - c. Centers for faculty and students' exchange programs and on-the-job trainings; and
 - d. Grantees of scholarship/additional facilities.
6. conduct continuously action researches on the needs of laboratory and other facilities that could be locally produced or innovated using local materials and adapted technology.
7. equip graduates with appropriate knowledge and technical skills imbued with desirable work attitudes and moral values, through enhanced teaching/learning process by using multimedia facilities on top of traditional methods;
8. develop faculty as competent mentors and quality researchers through advanced studies and other facets of continuing professional education

COURSE TITLE	<i>CpE Technology 1 (Consumer Electronics)</i>
COURSE CODE	<i>CMPE 40012</i>
CREDIT UNITS	<i>2 UNITS</i>
COURSE PREREQUISITE	
COURSE DESCRIPTION	<i>Basic theory and practice of electrical circuits. Includes calculations as applied to alternating and direct current.</i>



**POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

Institutional Learning Outcomes	Program Outcomes	Course Outcomes
<p>1. Creative and Critical Thinking Graduates use their imaginative as well as a rational thinking ability to life situations in order push boundaries, realize possibilities, and deepen their interdisciplinary and general understanding of the world.</p> <p>2. Effective Communication Graduates are proficient in the four macro skills in communication (reading, writing, listening, and speaking) and are able to use these skills in solving problems. Making decisions, and articulating thoughts when engaging with people in various circumstances.</p> <p>3. Strong Service Orientation Graduates exemplify the potentialities of an efficient, well-rounded and responsible professional deeply committed to service excellence.</p> <p>4. Community Engagement Graduates take an active role in the promotion and fulfillment of various advocacies (educational, social and environmental) for the advancement of community welfare.</p> <p>5. Adeptness in the Responsible Use of Technology Graduates demonstrate optimized use of digital learning abilities, including technical and numerical skills.</p> <p>6. Passion to Lifelong Learning Graduates are enabled to perform and function in the society by taking responsibility in their quest to know more about the world through lifelong learning.</p> <p>7. High Level of Leadership and Organizational Skills Graduates are developed to become the best professionals in their respective disciplines by manifesting the appropriate skills and leaderships qualities.</p> <p>8. Sense of Personal and Professional Ethics Graduates show desirable attitudes and behavior either in their personal and professional circumstances.</p> <p>9. Sense of National and Global Responsiveness Graduates' deep sense of national compliments the need to live in a global village where one's culture and other people culture are respected.</p>	<p>By the time of graduation, the students of the program shall have the ability to:</p> <p>a) Apply knowledge of mathematics and science to solve complex engineering problems;</p> <p>b) Design and conduct experiments, as well as to analyze and interpret data;</p> <p>c) Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability, in accordance with standards;</p> <p>d) Function on multidisciplinary teams;</p> <p>e) Identify, formulate, and solve complex engineering problems;</p> <p>f) Understanding of professional and ethical responsibility;</p> <p>g) Communicate effectively;</p> <p>h) Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;</p> <p>i) Recognition of the need for, and an ability to engage in life-long learning;</p> <p>j) Knowledge of contemporary issues;</p> <p>k) Use techniques, skills, and modern engineering tools necessary for engineering practice and</p> <p>l) Knowledge and understanding of engineering and management principles as a member and leader in a team, to manage projects and in multidisciplinary environments.</p>	<p>After completing the course, the student must be able to:</p> <ul style="list-style-type: none"> ▪ Identify electrical symbols and measuring instruments. ▪ Explain how to find resistor values with a meter and color code. ▪ Use an electrical meter to measure voltage, amperage, diodes, continuity, farads, and ohms. ▪ Use Ohm's law to find unknown values and calculate voltage drop. ▪ Define a series circuit and their properties. ▪ Define a parallel circuit and their properties. ▪ Solve a combination circuit using the laws of series and parallel. ▪ Explain how capacitance and inductance influence voltage and current relationships

Course Plan					
Week	Topic	Learning Outcomes	Methodology	Resources	Assessment



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

	<p>Class orientation with Vision, Mission, Goal and Objective</p> <p>Discussion of course goals, expected outcomes, course policies and grading system</p> <p>Assigning of Groups and Officers</p>	<p>Familiarize student on Outcome-Based Education</p> <p>Orient the student on the course syllabus, grading system and classroom rules</p>	<p>Orientation</p> <p>Review of the syllabus, learning activities and assessment</p> <p>Getting to know activity</p> <p>Ice breaker activity</p>	<p>Course Syllabus</p> <p>https://coelms.com</p>	<p>None</p>
1	<p>Learning the ABC's of Electronics, and Electricity</p> <ul style="list-style-type: none"> • Types of Electric charge particles • Basic Structure of the atom • Conductor, insulators and semiconductors • Potential Difference and voltage • Difference with voltage and current 	<p>Identify electrical symbols and measuring instruments.</p> <p>Sketch and use electrical schematics in class.</p> <p>Identify and define electrical Symbols used on electrical measuring instruments.</p>	<p>Lecture/Discussion</p> <p>Recitation</p> <p>Board Works</p>	<p>Ugly's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</p> <p>https://www.electronicstutorials.ws/</p> <p>Grob's Basic Electronics, Mitchell E. Schultz, McGraw-Hill, 2016</p> <p>https://coelms.com</p>	<p>Lecture Exam</p> <p>Problem Sets</p> <p>Board works</p> <p>Homework</p>
2	<p>Learning the ABC's of Electronics, and Electricity</p> <ul style="list-style-type: none"> • Types of Electric charge particles • Basic Structure of the atom • Conductor, insulators and semiconductors • Potential Difference and voltage 	<p>Explain how to find resistor values with a meter and color code</p>	<p>Lecture/Discussion</p> <p>Recitation</p> <p>Board Works</p>	<p>Ugly's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</p> <p>https://www.electronicstutorials.ws/</p> <p>Grob's Basic Electronics, Mitchell E. Schultz, McGraw-Hill, 2016</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lecture Exam</p> <p>Problem Sets</p> <p>Board works</p> <p>Homework</p>



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

	<ul style="list-style-type: none"> • Difference with voltage and current 			s.com	
3	Learning the ABC's of Electronics, and Electricity <ul style="list-style-type: none"> • Difference between conductance and resistance • Difference between electron flow and conventional current • Difference between Direct Current and Alternating Current 	<i>Use an electrical meter to measure voltage, current, continuity, farads, diodes, and ohms.</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGraw-Hill, 2016</i> https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework
4	Resistors and its uses <ul style="list-style-type: none"> • Types of Resistors • Resistor Color Coding • Variable Resistors • Rheostats and Potentiometers • Power Rating of Resistors and resistors troubles 	<i>Explain how capacitance and inductance influence voltage and current relationships.</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGraw-Hill, 2016</i> https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

5 - 6	Ohm's Law: Series Circuits <ul style="list-style-type: none"> • Circuit Symbols and Circuit Diagrams • Two Types of Connections • Series Circuits • Combination Circuits 	Use Ohm's law to find unknown values and calculate voltage drop.	Lecture/Discussion Recitation Board Works	Ugly's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition https://www.electronicstutorials.ws/ Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill, 2016 https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework
7 - 8	Ohm's Law: Parallel Circuits <ul style="list-style-type: none"> • The Applied Voltage VA Is the Same across Parallel Branches • Each Branch I Equals VA/R 5 Kirchhoff's Current Law (KCL) • Resistances in Parallel 5-5 Conductance in Parallel • Total Power in Parallel Circuits • Analyzing Parallel Circuits with Random Unknowns • Troubleshooting: Opens and Shorts in Parallel Circuits 	Define a parallel circuit and their properties	Lecture/Discussion Recitation Reporting Board Works	Ugly's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition https://www.electronicstutorials.ws/ Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill, 2016 https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework
9	M I D T E R M E X A M I N A T I O N				



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

10 - 11	Series-Parallel Circuits <ul style="list-style-type: none"> • Finding R_T for Series-Parallel Resistances • Resistance Strings in Parallel • Resistance Banks in Series • Resistance Banks and Strings in Series-Parallel • Analyzing Series-Parallel Circuits with Random Unknowns • The Wheatstone Bridge • Troubleshooting: Opens and Shorts in Series-Parallel Circuit 	<i>Solve a combination circuit using the laws of series and parallel.</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill, 2016</i> https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework
12 – 13	Voltage Dividers and Current Dividers <ul style="list-style-type: none"> • Series Voltage Dividers • Current Divider with Two Parallel Resistances • Current Division by Parallel Conductance • Series Voltage Divider with Parallel Load Current • Design of a Loaded Voltage Divider 	<i>Explain how inductance changes an AC waveform.</i> <i>Explain how capacitance changes an AC waveform</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill, 2016</i> https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

14	Kirchhoff's Law <ul style="list-style-type: none"> • Kirchhoff's Current Law (KCL) • Kirchhoff's Voltage Law (KVL) • Method of Branch Currents • Node-Voltage Analysis • Method of Mesh Currents 	<i>Construct a combination circuit and demonstrate the applicable laws.</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill, 2016</i> https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework
15	Network Theorems <ul style="list-style-type: none"> • Superposition Theorem • Thevenin's Theorem • Thevenizing a Circuit with Two Voltage Sources • Thevenizing a Bridge Circuit • Norton's Theorem • Thevenin-Norton Conversions • Conversion of Voltage and Current Sources • Millman's Theorem • T or Y and or Connections 	<i>Define parallel circuit construction and prove the applicable laws</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill, 2016</i> https://coelms.com	Quiz Lecture Exam Problem Sets Board works Homework
16	Conductors and Insulators <ul style="list-style-type: none"> • Function of the Conductor • Standard Wire Gage Sizes • Types of Wire Conductors • Connectors • Printed Wiring and switches 	<i>Identify and use the correct formula to solve for unknowns in a given circuit.</i>	Lecture/Discussion Recitation Board Works	<i>Ugley's Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchell E. Schultz, McGrawHill,</i>	Lecture Exam Problem Sets Board works Homework



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

				2016 https://coelms.com	
17	Conductors and Insulators <ul style="list-style-type: none"> • Fuses • Wire Resistance • Temperature Coefficient of Resistance • Ion Current in Liquids and Gases • Insulators • Troubleshooting Hints for Wires and Connectors 	Describe the differences between the functions of Conductors and Insulators	Lecture/Discussion Recitation Board Works	Ugly's <i>Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> https://www.electronicstutorials.ws/ <i>Grob's Basic Electronics, Mitchel E. Schultz, McGrawHill, 2016</i> https://coelms.com	Lecture Exam Problem Sets Board works Homework

18	FINAL EXAMINATION
Course Requirement	
<p>Besides the Quizzes, Assignments, Recitation, Major Examinations and Lab Activities, Before the end of the semester, the students are required to present an application project in groups of four to five members dealing with the application of Computer Engineering Technology 1</p>	
Reading and References	
<p>Ugly's <i>Electrical Safety and NFPA 70E, 2015 Edition 3rd Edition</i> Grob's <i>Basic Electronics, Mitchel E. Schultz, McGrawHill, 2016</i> Schaum's <i>Outline of Electric Circuits, Seventh Edition, 2017</i> <i>Principles of Electric Circuits: Pearson New International Edition: Conventional Current Version</i> Charles Alexander, <i>Fundamentals of Electric Circuits 2016</i> Cathleen Shamieh, <i>Getting Started with Electronics: Build Electronic Circuits!</i> James Kang, <i>Electric Circuits, CL Engineering, 2017</i> James W. Nilsson, <i>Electric Circuits, Global Edition Pearson Education Limited, 2019</i></p>	
Online References:	
<p>https://coelms.com https://www.electronicshub.org/tutorials/ https://www.electronicstutorials.ws/ https://www.makerspaces.com/basic-electronics/ http://electronics-tutorial.net/ https://circuitdigest.com/tutorials https://www.open.edu/openlearn/science-maths-technology/introduction-electronics/</p>	
Course Grading System	



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

To pass this course, one must accumulate at least 75% through the course requirements. The maximum points that a student can obtain through each requirement are shown below.

Requirement/Assessment Task	Maximum Percentage
Quizzes/Assignment/Recitation	20%
Midterm/Final Exam	40%
Laboratory Exercises and Machine Problems/Application Project Presentation	40%
	100%

Classroom Policy

1. Written tests during the semester.
2. Three scheduled major written tests. Make up tests will only be given with prior permission of the instructor. Make up tests must be taken within a week of the original scheduled test date unless there is an inevitable reason.
3. Participation in class discussions and group exercises is a must; thus attendance and being prepared to contribute to the discussion is also expected.
4. Upon entrance to the classroom, submission of assignments is expected; and working on the challenge of the day is also to be observed.
5. Punctuality is to be observed. If students come in late for three consecutive occurrences would be equivalent to one absent. Students should also be responsible for missed materials.
6. Always follow the 5 S's and CLAYGO (*Clean As You GO*)

Written tests – It will be administered periodically in order to assess the students' knowledge of topics within the Syllabus. Use of cellphone during examinations IS prohibited.

Class Work/Activities – Students are expected to participate in all activities and assignments.

Oral Presentations – Students will be expected to present topics that will demonstrate their understanding of the specific subjects. Included in oral presentations are role playing, simulations, topic or research presentations or focused group discussions.

Strict implementation of deadlines - No late projects, papers, researches or quizzes will be accepted unless you have made prior arrangements in writing with the instructor and have a valid and documented reason. All late projects that are accepted will have appropriate deductions.

Quizzes - Make-up quizzes must be done only at the available schedule of the instructor. Unjustified absence resulting to missed quizzes shall be awarded with an equivalent grade of 20.

Special Arrangements and considerations – no special arrangements and considerations will be given after the final term. The students' grades shall stand as they are except when errors in the checking of requirements and/or inputting of grades by the instructor were found. Change of grade procedure will be then followed for the necessary changes to take effect.

Cheating - All graded requirements must be a students' own work only. Cheating or plagiarism is a serious breach of academic ethics and policy (refer to students manual) and could lead to appropriate sanctions. When taking tests, answer must not be seen by others. If cheating is discovered, all participants will be penalized with a grade of zero for the particular test.

Student contributions – In cases wherein students are grouped to complete a specific task, members must actively participate or risk being eliminated from the groupings.

Etiquette: Courtesy in class from every student is expected especially during classroom experience. Mobile phones must always be kept silent and are not allowed to be used for texting or browsing inside the room at any time. Personal/portable media players must be put away and should not be used at any time inside the classroom. The instructor has the right to ask a student who has a disruptive behavior to leave the class. All students are expected to be familiar with and to follow the guidelines set in the University student manual.

Attendance – Students who reach the maximum allowable absences will no longer be allowed to continue the course as stated in the University student manual and will receive a grade of DROPPED.

Incomplete Grades – Students who got an INC – Incomplete Grade at the end of the semester must complete his/her requirements within one year. Failure to do so, the SIS will automatically replace the INC rating into a grade of 5.0.

Consultation Time

As indicated on the approved Teaching Assignment of the concern faculty and posted on the Department's Bulletin Board

Revision History



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Revision Number	Description of Change	Effective Date	Approved by:
2.0	OBE Syllabus Format and Contents	June 17, 2019	
Prepared by:		Date:	
Engr. Ronald D. Fernando Permanent Faculty Engr. Joshua Benjamin B. Rodriguez Part-time Faculty Engr. Orlando Tubola Permanent Faculty Engr. John R. Dela Cruz Part-time Faculty		Reviewed by: Engr. Julius S. Cansino Chairperson, CpE Department	
Noted by:		Date:	
DR. REMEDIOS G. ADO Dean, College of Engineering			
Approved by:		Date:	
DR. MANUEL M. MUHI Vice-President, Academic Affairs			



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT



Polytechnic University of the Philippines
COLLEGE OF ENGINEERING
DEPARTMENT COMPUTER ENGINEERING

Vision

Clearing the paths while laying new foundations to transform the Polytechnic University of the Philippines into an epistemic community.

Mission

Reflective of the great emphasis being given by the country's leadership aimed at providing appropriate attention to the alleviation of the plight of the poor, the development of the citizens, and of the national economy to become globally competitive, the University shall commit its academic resources and manpower to achieve its goals through:

- Provision of undergraduate and graduate education which meet international standards of quality and excellence;
- Generation and transmission of knowledge in the broad range of disciplines relevant and responsive to the dynamically changing domestic and international environment;
- Provision of more equitable access to higher education opportunities to deserving and qualified Filipinos; and
- Optimization, through efficiency and effectiveness, of social, institutional, and individual returns and benefits derived from the utilization of higher education resources.

Goals

1. Provide quality education through instruction, advance research and extension services.
2. Produce world-class professionals as potential industry leaders and job providers.
3. Develop and produce facilities through the use of adapted technology and indigenous materials.
4. Maintain, upgrade or improve facilities through the applications of engineering technology.

Objectives

1. Strengthen the Bachelor of Science in Computer Engineering program consistent with global trends;
2. Develop the critical thinking and communication skills of students, giving emphasis to research and extension services;
3. Enhance the competencies of students to evaluate, assess, design and operate safe, effective, economically-efficient and environmental friendly computer-based system;
4. create a conducive teaching and learning atmosphere with emphasis to Bachelor of Science in Computer Engineering faculty and students' growth and academic freedom;
5. establish network with educational institutions, Industries, GO's and NGO's, local and international, which could serve as:
 - a. Funding sources and/or partners of researches;
 - b. Sources of new technology;
 - c. Centers for faculty and students' exchange programs and on-the-job trainings; and
 - d. Grantees of scholarship/additional facilities.
6. conduct continuously action researches on the needs of laboratory and other facilities that could be locally produced or innovated using local materials and adapted technology.
7. equip graduates with appropriate knowledge and technical skills imbued with desirable work attitudes and moral values, through enhanced teaching/learning process by using multimedia facilities on top of traditional methods;
8. develop faculty as competent mentors and quality researchers through advanced studies and other facets of continuing professional education

COURSE TITLE	Logic Circuits and Design
COURSE CODE	CMPE 30094



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

CREDIT UNITS	3 UNITS	
COURSE PREREQUISITE	Fundamentals of Electronic Circuits	
COURSE DESCRIPTION	The course includes design and analysis of digital circuits. This course covers both combinational (synchronous and asynchronous) logic circuits with emphasis on solving digital problems using hardwired structures of the complexity of medium and large-scale integration.	
Institutional Learning Outcomes	Program Outcomes	Course Outcomes
<p>1. Creative and Critical Thinking Graduates use their imaginative as well as a rational thinking abilities to life situations in order push boundaries, realize possibilities, and deepen their interdisciplinary and general understanding of the world.</p> <p>2. Effective Communication Graduates are proficient in the four macro skills in communication (reading, writing, listening, and speaking) and are able to use these skills in solving problems. Making decisions, and articulating thoughts when engaging with people in various circumstances.</p> <p>3. Strong Service Orientation Graduates exemplify the potentialities of an efficient, well-rounded and responsible professional deeply committed to service excellence.</p> <p>4. Community Engagement Graduates take an active role in the promotion and fulfillment of various advocacies (educational, social and environmental) for the advancement of community welfare.</p> <p>5. Adeptness in the Responsible Use of Technology Graduates demonstrate optimized use of digital learning abilities, including technical and numerical skills.</p> <p>6. Passion to Lifelong Learning Graduates are enabled to perform and function in the society by taking responsibility in their quest to know more about the world through lifelong learning.</p> <p>7. High Level of Leadership and Organizational Skills Graduates are developed to become the best professionals in their respective disciplines by manifesting the appropriate skills and leaderships qualities.</p> <p>8. Sense of Personal and Professional Ethics Graduates show desirable attitudes and behavior either in their personal and professional circumstances.</p> <p>9. Sense of National and</p>	<p>By the time of graduation, the students of the program shall have the ability to:</p> <p>a) Apply knowledge of mathematics and science to solve complex engineering problems;</p> <p>b) Design and conduct experiments, as well as to analyze and interpret data;</p> <p>c) Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability, in accordance with standards;</p> <p>d) Function on multidisciplinary teams;</p> <p>e) Identify, formulate, and solve complex engineering problems;</p> <p>f) Understanding of professional and ethical responsibility;</p> <p>g) Communicate effectively;</p> <p>h) Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;</p> <p>i) Recognition of the need for, and an ability to engage in life-long learning;</p> <p>j) Knowledge of contemporary issues;</p> <p>k) Use techniques, skills, and modern engineering tools necessary for engineering practice and</p> <p>l) Knowledge and understanding of engineering and management principles as a member and leader in a team, to manage projects and in multidisciplinary environments.</p>	<p>After completing the course, the student must be able to:</p> <ul style="list-style-type: none"> • Define and identify important logic switching circuit theories and terminologies • Use Boolean Algebra in simplifying logic circuits and solving related problems • Apply different minimization techniques in designing combinational circuits and in solving related problems • Design combinational and/or sequential digital system or sub-system



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Global Responsiveness Graduates' deep sense of national compliments the need to live in a global village where one's culture and other people culture are respected.					
Course Plan					
Week	Topic	Learning Outcomes	Methodology	Resources	Assessment
	Class orientation with Vision, Mission, Goal and Objective Discussion of course goals, expected outcomes, course policies and grading system Assigning of Groups and Officers	<i>Familiarize student on Outcome-Based Education</i> <i>Orient the student on the course syllabus, grading system and classroom rules</i>	Orientation Review of the syllabus, learning activities and assessment Getting to know activity Ice breaker activity	Course Syllabus https://coelms.com	None
1	Review on Number Systems Introduction to number system (Binary, Octal, Decimal, Hexadecimal) <ul style="list-style-type: none"> Conversion of Number System Arithmetic operation Fixed Point representation 	<i>Define terms</i> <i>Know the function of number system</i> <i>Convert any given number system</i> <i>Write the equivalent negative values of a given binary number</i> <i>Perform arithmetic operation (addition, subtraction, multiplication and division) of any number system</i>	Lecture/Discussion Problem Solving Recitation Board work	<i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i> https://learn.sparkfun.com/tutorials/digital-logic https://logic.ly/lessons/ https://www.electrical4u.com/digital-electronics/ https://coelms.com	Quiz Lab Activity Blended Learning Exercises Homework



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

2	Logic Gates, Boolean Algebra, Logic Circuit and Truth Table <ul style="list-style-type: none"> • Basic logic gates and pin configuration • Boolean expression 	Describe the operation of the INVERTER, the AND, the NAND, the OR, the NOR, The XOR, and the XNOR gates Identify the IC pin configuration of the logic gates	Lecture/Discussion Problem Solving Recitation Board work	<i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i> https://www.electrical4u.com/digital-electronics/	Quiz Lab Activity Blended Learning Exercises Homework
---	--	---	---	--	--



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

3	Combinational Circuit Analysis, Boolean Expression Analysis, Minterm and Maxterm <ul style="list-style-type: none"> Derive the Boolean expression and truth table given a circuit Derive the truth table and design the circuit given an expression Derive the standard SOP and POS expression 	<p>Identify the columns of a truth table</p> <p>Describe the canonical form of Boolean Expressions</p> <p>Differentiate the Sum-of-product (SOP) forms of Boolean expression from Product-of-Sum (POS) forms.</p>	Lecture/Discussion Problem Solving Recitation Board work	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	Quiz Lab Activity Blended Learning Exercises Homework
4	Boolean Expression Simplification <ul style="list-style-type: none"> Discuss the 10 Boolean identities Application of De Morgan's Theorem Simplifying an expression 	<p>Discuss the objectives of simplifying Boolean expressions</p> <p>Enumerate the methods of Boolean expressions simplification</p> <p>Acquaint themselves with Boolean Identities</p> <p>Apply De Morgan's Theorem to Boolean Expressions and to logic circuit</p>	Lecture/Discussion Problem Solving Recitation Board work	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	Quiz Lab Activity Blended Learning Exercises Homework
5	Conversion of any Product Term to Standard form and Conversion of any Sum Term to Standard form <ul style="list-style-type: none"> Discuss the procedure on how to convert an expression to its standard form 	<p>Determine the domain of a Boolean expression</p> <p>Convert any SOP expression to standard SOP</p> <p>Express SOP expression into</p>	Lecture/Discussion Problem Solving Recitation Board work	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p>	Quiz Lab Activity Blended Learning Exercises Homework



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

		<p>Canonical Form</p> <p>Convert any POS expression to standard POS</p> <p>Express POS expression into Canonical Form</p>		<p>https://coelms.com</p>	rk
6	<p>The Karnaugh-map Simplification (SOP, POS and with don't care conditions)</p> <ul style="list-style-type: none"> Discuss how to construct and fill out a K-map given either a truth table, an expression or a notation. Discuss the steps in simplifying an expression using k-map Discuss the rules in grouping of 1's/0's with don't care condition in k-map Discuss how to derive the simplified expression using k-map 	<p>Differentiate Map method from Algebraic simplification technique</p> <p>Construct two-, three-, four-, d five and six - variables K-Maps</p> <p>Fill-out the K-map with terms from Sum-of-Products (SOP) expressions / Product-of-Sum (POS)</p> <p>Combine the 1s/0's on the map into largest group possible and into minimum number of groups</p> <p>Determine the product term/sum term for each group in the map</p> <p>Combine the minimum product terms/sum terms to form the simplified SOP/POS expressions</p>	<p>Lecture/Discussion</p> <p>Problem Solving</p> <p>Recitation</p> <p>Board work</p>	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lab Activity</p> <p>Blended Learning Exercises</p> <p>Homework</p>



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

		<p>Construct the circuit of the simplified SOP/POS expression (AND-OR Network/OR-AND Network)</p> <p>Describe don't care condition</p> <p>Simplify expressions with don't-care conditions</p>			
7	<p>Other Two-level Implementations (SOP/POS)</p> <ul style="list-style-type: none"> Discuss how to derive and construct a combinational circuit using other SOP Networks Discuss how to derive and construct circuit using other SOP Networks <p>Combinational Circuit Design</p> <ul style="list-style-type: none"> Discuss the steps on how to design a combinational circuit Discuss how to determine the number of input and output variables need based on the given problems statement 	<p>Construct the logic circuit of the simplified SOP expression using the NAND – NAND, OR – NAND & NOR – OR network</p> <p>Construct the logic circuit of the simplified POS expressions using the NOR – NOR, AND – NAND – AND network</p>	<p>Lecture/Discussion</p> <p>Problem Solving</p> <p>Recitation</p> <p>Board work</p>	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lab Activity</p> <p>Blended Learning Exercises</p> <p>Homework</p>
8	<p>Combinational Circuit Design using MSI and LSI Devices (Decoder)</p> <ul style="list-style-type: none"> Discuss how to design a combinational circuit using MSI Device 	<p>Describe the operation of a Decoder</p> <p>Implement Boolean function using a Decoder</p>	<p>Lecture/Discussion</p> <p>Problem Solving</p>	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p>	<p>Quiz</p> <p>Lab Activity</p>



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

	<p>(Decoder) given a problem statement</p> <p>Combinational Circuit Design using MSI and LSI Devices (Multiplexer)</p> <ul style="list-style-type: none"> Discuss how to design a combinational circuit using MSI Device (Multiplexer) given a notation <p>Combinational Circuit Design using MSI and LSI Devices (ROM)</p> <ul style="list-style-type: none"> Discuss how to design a combinational circuit using MSI Device (ROM) given a notation 	<p>Describe the operation of a Multiplexer implement Boolean function using a Multiplexer</p> <p>Describe the operation of a Read-Only Memory (ROM) Implement Boolean function using a ROM</p>	<p>Recitation</p> <p>Board work</p>	<p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	<p>Blended Learning Exercises</p> <p>Homework</p>
9	M I D T E R M E X A M I N A T I O N				
10	<p>Introduction to Sequential Circuits</p> <ul style="list-style-type: none"> Types of Sequential Circuits Types of Clocking Characteristic Table Derivation of Excitation Table Timing Diagram Flip-flop Conversion 	<p>Differentiate Combination Circuit from Sequential Circuits</p> <p>Discuss the 4 types of Flip-flops</p> <p>Discuss the use and type of clocking</p> <p>Define and construct the Characteristic tables of the 4 types of Flip-flops</p> <p>Derive the excitation table of the 4 types of Flip-flops</p> <p>Discuss how the draw the timing diagram for each type of flip-flop</p>	<p>Lecture/Discussion</p> <p>Problem Solving</p> <p>Recitation</p> <p>Board work</p>	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lab Activity</p> <p>Blended Learning Exercises</p> <p>Homework</p>



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

		Discuss the steps of converting one flip-flop type to another			
1 1	Analysis of Sequential Circuits	<p>Discuss the steps in analyzing a synchronous sequential circuits.</p> <p>Analyze a synchronous sequential circuits from a state diagram, from a state table, for state equation</p> <ul style="list-style-type: none"> Discuss the steps on how analyze a given sequential circuit to derive the state equation and state diagram 	<p>Lecture/Discussion</p> <p>Problem Solving</p> <p>Recitation</p> <p>Board work</p>	<p>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lab Activity</p> <p>Blended Learning Exercises</p> <p>Homework</p>
1 2	Design of Sequential Circuits	<p>Discuss the steps on how design a sequential circuit given a state diagram</p> <p>Illustrate how to design a synchronous sequential circuits based on a worded-problem specification</p> <ul style="list-style-type: none"> Steps in designing a synchronous sequential circuits. Walk-through on the steps on designing a synchronous sequential circuits based on a worded-problem specification 	<p>Lecture/Discussion</p> <p>Problem Solving</p> <p>Recitation</p> <p>Board work</p>	<p>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lab Activity</p> <p>Blended Learning Exercises</p> <p>Homework</p>
1 3	Design of Counters	<p>Learn the importance and applications of counters</p> <p>Identify the types of counters</p> <p>Discuss the steps on how design a counter given a state diagram or a problem statement</p> <p>Learn the limitations of counters</p> <p>Learn how</p> <ul style="list-style-type: none"> Concept of Counters Types of Counters Steps in designing synchronous counters Limitations of Counters Applications of Counters Troubleshooting Counter circuits 	<p>Lecture/Discussion</p> <p>Problem Solving</p> <p>Recitation</p> <p>Board work</p>	<p>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	<p>Quiz</p> <p>Lab Activity</p> <p>Blended Learning Exercises</p> <p>Homework</p>



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

		to troubleshoot common problems of counters			
1 4	Design of Registers <ul style="list-style-type: none"> • Concept of Registers • Type of Register • Steps in designing registers • Limitations of Registers • Applications of Registers • Troubleshooting Register circuits 	<p>Learn the importance and applications of register</p> <p>Identify the types of registers</p> <p>Discuss the steps on how design a register given a state diagram or a problem statement</p> <p>Learn the limitations of registers</p> <p>Learn how to troubleshoot common problems of registers</p>	Lecture/Discussion Problem Solving Recitation Board work	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	Quiz Lab Activity Blended Learning Exercises Homework
1 5 - 1 6	Design and Analysis of Asynchronous Sequential Circuits <ul style="list-style-type: none"> • Concept of Asynchronous sequential circuits • Steps in designing and Analysis of Asynchronous sequential circuits • Applications of Asynchronous Sequential circuits • Troubleshooting Asynchronous sequential circuits 	<p>Learn the importance and applications of Asynchronous Sequential Circuits</p> <p>Discuss the steps on how design and analyze Asynchronous Sequential Circuits</p> <p>Learn how to troubleshoot common problems of Asynchronous Sequential</p>	Lecture/Discussion Problem Solving Recitation Board work	<p><i>Digital Systems Principles and Applications, Ronald J. Tocci and Neal S. Widmer Upper Saddle River, N.J.: Pearson 2016</i></p> <p>https://learn.sparkfun.com/tutorials/digital-logic</p> <p>https://logic.ly/lessons/</p> <p>https://www.electrical4u.com/digital-electronics/</p> <p>https://coelms.com</p>	Quiz Lab Activity Blended Learning Exercises Homework