Republic of the Philippines
OFFICE OF THE PRESIDENT
COMMISSION ON HIGHER EDUCATION

Commission on Higher Education
OFFICIAL RELEASE
CHED Central Office
RECORDS SECTION
C.P. Garcia Ave., U.P. Diliman, Q.C.

CHED MEMORANDUM ORDER
No. 13
Series of 2023

SUBJECT: POLICIES, STANDARDS, AND GUIDELINES FOR THE BACHELOR OF INDUSTRIAL TECHNOLOGY (BIndTech) PROGRAM

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the *"Higher Education Act of 1994,"* in pursuance of an outcomes-based quality assurance system as advocated under CMO 46 s. 2012 (Policy-Standard to Enhance Quality Assurance (QA) in Philippine Higher Education through an Outcomes-Based and Typology-Based QA, and by virtue of Commission *en banc* Resolution No. 329-2023 dated June 6, 2023, the following Policies, Standards, and Guidelines (PSG) for the Bachelor of Industrial Technology program are hereby adopted and promulgated by the Commission.

ARTICLE I
INTRODUCTION

Section 1. Rationale

Based on the *Guidelines for the Implementation of CMO No. 46, series of 2012,* this PSG implements the shift to outcomes-based education (OBE) leading to competency-based standards. It specifies the "core competencies" expected of Bachelor of Industrial Technology (BIndTech) graduates "regardless of the type of Higher Education Institutions (HEI) they graduate from." However, in recognition of outcomes-based education and the typology of HEIs, this PSG also provides ample space for HEIs to innovate in the curriculum in line with the assessment of how best to achieve learning outcomes in their particular contexts and their respective missions.

The need for a well-educated and skilled workforce in the field of industrial technology is considered as an important factor in the advancement of the country. The human resource infrastructure of the nation must be designed with the capability to maximize economic growth, sustainable development, and global competitiveness.

Higher Education Institutions offering Industrial Technology programs are mandated to perform the crucial role of providing education and training for the production and manufacturing manpower skills with the graduates capable of performing the technical, managerial, research, and entrepreneurial roles and functions. As such, it is with utmost importance that the highest standards are set in defining the objectives, components, and the process of implementing the industrial technology curriculum.

Higher Education Development Center Building, C.P. Garicia Ave., UP Campus, Diliman, Quezon City, Philippines
Web Site: www.ched.gov.ph Tel. Nos. 8441-1177, 8385-4391, 8441-1169, 8441-1149, 8441-1170, 8441-1216, 8392-5296, 8441-1220
8441-1228, 8988-0002, 8441-0750, 8441-1254, 8441-1235, 8441-1255, 8411-8910, 8441-1171, 8352-1871

ARTICLE II
AUTHORITY TO OPERATE

Section 2. Government Recognition

All public and private higher education institutions (HEIs) must first secure appropriate government authority/certificate of program compliance from the Commission in accordance with these Policies, Standards and Guidelines (PSG). Autonomous institutions should likewise strictly adhere to the provisions of these policies and standards.

ARTICLE III
GENERAL PROVISIONS

Per Section 13 of RA 7722, the higher education institution shall exercise academic freedom in its curricular offerings but must comply with the minimum requirements for specific academic programs, the general education distribution requirements, and the specific professional courses.

Section 3. Minimum Standards

The Articles that follow give minimum standards and other requirements and guidelines. The minimum standards are expressed as a minimum set of desired program outcomes which are given in Article IV Section 6. CHED designed a curriculum to attain such outcomes. This curriculum is shown in Article V Section 10 and Section 11 as a sample curriculum. The number of units of this curriculum is herein prescribed as the "minimum unit requirement" under Section 13 of RA 7722. To assure alignment of the curriculum with the program outcomes, this PSG provides a sample curriculum map in Article V Section 12.

A sample course syllabus is also given in Article V Section 13 as support to the outcomes-based delivery method.

Based on the curriculum and the means of its delivery, CHED determined the physical resource requirements for the library, laboratories, and other facilities and the human resource requirements in terms of administration and faculty. These are given in Article VI.

Section 4. Curriculum Design

The HEIs are allowed to design curricula suited to their own contexts and missions provided that they can demonstrate that the same leads to the attainment of the required minimum set of outcomes, albeit by a different route. In the same vein, they have latitude in terms of curriculum delivery and in terms of specification and deployment of human and physical resources as long as they can show that the

attainment of the program outcomes and satisfaction of program educational objectives can be assured by the alternative means they propose.

HEIs can use the *CHED Implementation Handbook for Outcomes-Based Education (OBE) and Institutional Sustainability Assessment (ISA)* as a guide in making their submissions for Sections 19 to 24 of Article VII.

ARTICLE IV
PROGRAM SPECIFICATIONS

Section 5. Program Description

5.1 Degree Name

The degree program herein shall be called Bachelor of Industrial Technology (BIndTech) with the following majors, including but not limited to :

1. Automotive Technology
2. Electronics Technology
3. Electrical Technology
4. Welding and Fabrication Technology
5. Heating, Ventilating, Air Conditioning, and Refrigeration Technology
6. Mechanical Technology
7. Construction Technology
8. Culinary Technology
9. Apparel and Fashion Technology
10. Architectural Drafting Technology
11. Die and Moulds Technology*
12. Instrumentation and Control Technology
13. Print Media Technology
14. Beauty Care and Wellness Technology
15. Computer Technology
16. Mechatronics Technology

HEIs may identify other majors depending on the demand and needs of the industry and the priority and capability of the HEI.

5.2 Nature of the Field of Study

The Bachelor of Industrial Technology (BIndTech) program is intended to prepare students for a professional career in Industrial Technology. The BIndTech program shall impart a body of knowledge, skills, attitudes, values, and experiences that will provide prospective industrial workers with the necessary competencies essential for effective and efficient production and manufacturing technologists and research functions.

5.3 Program Educational Objectives

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve within a few years after graduation. PEOs are based on the needs of the program's constituencies and these shall be determined, articulated, and disseminated to the general public by the unit or department of the HEI offering the BIndTech program. The PEOs should also be reviewed periodically for continuing improvement.

5.4 Specific Professions/Careers and Entry-Level Competency Standards for Bachelor of Industrial Technology (BIndTech) Graduates

Graduates of BIndTech can have professions and careers as:

a. Technologist
b. Specialist
c. Quality controller
d. Industry manager
e. Supervisors
f. Consultants
g. Technology developer
h. Researcher
i. Innovator
j. Technopreneurs

5.5 Allied Programs

The allied programs for Industrial Technology are Mechanical Engineering, Manufacturing Engineering, Engineering Management, Statistics, Business Administration, Computer Science, Electrical Engineering, Industrial Engineering, Civil Engineering, Information Technology, Electronics Engineering, and Engineering Technology.

Section 6. Institutional and Program Outcomes

The minimum standards for the BIndTech program are expressed in the following minimum set of institutional and BIndTech program outcomes.

6.1 Institutional Outcomes

The graduates of higher education institutions must:

a. Demonstrate a service orientation in their profession
b. Participate in various types of employment, development activities, and public discourses, particularly in response to the needs of the communities one serves
c. Participate in the generation of new knowledge or in research and development projects
d. Have the competencies to support "national, regional and local development plans" (RA 7722)

e. Preserve and promote the Filipino historical and cultural heritage.

6.2 BIndTech Program Outcomes

The program outcomes for BIndTech are given in the following minimum set. Graduates of the program must have:

a. Ability to analyze broadly-defined industrial technology processes by using analytical tools that enhance creativity, innovativeness, and intellectual curiosity to improve methods, processes, and systems that meet the industry standards

b. Ability to implement broadly-defined industrial systems, components, products, or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards

c. Ability to apply appropriate techniques, resources, and state-of-the-art industrial technology tools to meet current industry needs and use these modern tools and processes to improve and increase entrepreneurial activities upholding the safety and health standards of business and industry

d. Ability to communicate with diverse groups of clienteles the appropriate cultural language with clarity and persuasion, in both oral and written forms, including understanding and giving of clear instructions, high comprehension level, effectiveness in delivering presentations and writing documents, and articulating technological innovation outputs

e. Ability to develop leadership and management skills in a team-based environment by making informed decisions, keeping the team motivated, acting & delegating responsibility, and inspiring positive changes in the organization by exercising responsibility with integrity and accountability in the practice of one's profession

f. Practice the moral responsibilities of an industrial technologist to manage and balance wider public interest and uphold the norms and safety standards of the industrial technology profession

g. Ability to demonstrate enthusiasm and passion for continuous personal and professional development in broadly-defined industrial technology and effecting positive changes in the entrepreneurial and industrial endeavor

h. Recognition of the need for, and an ability to engage in lifelong learning

A PHEI, SUC, or LUC, at its option, may adopt mission-related program outcomes that are not included in the minimum set

Annex I present the Competency Standards for the graduates of the Bachelor of Industrial Technology which should result from the program outcomes stated above.

Section 7. Sample Performance Indicators

Performance Indicators are specific, measurable statements identifying the performance(s) required to meet the outcome; confirmable through evidence.

Table 1. Sample Matrix Connecting Program Outcomes with Performance Indicators

Program Outcomes		Performance Indicators	
b	Ability to design and implement broadly defined industrial systems, components, products, or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards	1	Defines objectives of the activities
		2	Collects sufficient and appropriate data to support the objectives of the activities
		3	Analyze data using appropriate methods
		4	Relates data analysis to the objectives of the activities

Section 8. Program Assessment and Evaluation

Program Assessment refers to one or more processes that identify, collect, and prepare data to evaluate the attainment of Program Outcomes and Program Educational Objectives.

In the case of Program Outcomes Assessment, the defined Performance Indicators shall be connected to Key Courses (usually the Demonstrating or "D" courses in the Curriculum map), and appropriate Assessment Methods (AM) may be applied. These methods may be direct or indirect depending on whether the demonstration of learning was measured by actual observation and authentic work of the student or through gathered opinions from the student or the student's peers.

Table 2. Sample Matrix Connecting Performance Indicators with Key Courses, Assessment Methods, and Target and Standards

Performance Indicators		Key Courses	Assessment Methods	Target and Standards
1	Define the objectives of the activities	Project Study 1 with IPR	Project Study Proposal Paper	75% of students get a rating of at least 60%
2	Collect sufficient and appropriate data to support the objectives of the activities	Project Study 1 with IPR	Project Study Report	75% of students get a rating of at least 60%

3	Analyze data using appropriate methods	Project Study 2	Project Study Report	75% of students get a rating of at least 60%
4	Relate data analysis to the objectives of the activities	Project Study 2	Project Study Report	75% of students get a rating of at least 60%

For the Assessment of Program Educational Objectives, the stakeholders of the program have to be contacted through surveys or focus group discussions to obtain feedback data on the extent of the achievement of the PEOs.

Program Evaluation pertains to one or more processes for interpreting the data and evidence accumulated from the assessment. Evaluation determines the extent to which the Program Outcomes and the Program Educational Objectives are achieved by comparing actual achievement versus set targets and standards. Evaluation results in decisions and actions regarding the continuous improvement of the program.

Other Methods of Program Assessment and Evaluation may be found in the *CHED Implementation Handbook for Outcomes-Based Education (OBE) and Institutional Sustainability Assessment (ISA).*

Section 9. Continuous Quality Improvement

There shall be a documented process for the internal and external assessment and evaluation of program educational objectives and program outcomes.

The comparison of achieved performance indicators with declared targets or standards of performance should serve as the basis for the priority projects or programs for improving the weak performance indicators. Such projects and programs shall be documented as well as the results of their implementation. This regular cycle of documentation of projects, programs for remediation, and their successful implementation shall serve as the evidence for Continuous Quality Improvement (CQI).

ARTICLE V
CURRICULUM

Section 10. Curriculum Description

The Bachelor of Industrial Technology curriculum is designed for the preparation of students for a higher industrial workforce who is equipped with technical, managerial, research, and entrepreneurial competencies in the different fields in industrial technology. Specifically, it is expected to produce manufacturing and production technologists who can work individually or team up with scientists or engineers for the advancement of industrial technology, research, training and production and can assume the following major roles:

a. Improve productivity, make the people employable, enhance human capital, attract investment and ignite a virtuous cycle of development;
b. Efficiently produce goods and services that meet the requirements of domestic and international markets;
c. Develop innovative technologies significant to sustainable national development;
d. Model technologists imbued with positive/proper work attitudes and values as practiced in the industry; and
e. Develop nationally certified technologists in their field of specialization

Section 11. Sample Curriculum

11.1 Components – refer to **Annex II (A.1, B.1, C.1)**

11.2 Sample Program of Study – refer to **Annex II (A.2, B.2, C.2)**

The institution may enrich the sample program of study depending on the needs of the industry, provided that all prescribed courses required in the curriculum outlines are offered and pre-requisites and co-requisites are complied with.

The sample Program of Study is meant for HEIs operating on a Semestral System. HEIs with CHED-approved trimester or quarter-term systems may adjust their courses and course specifications accordingly to fit their delivery system, as long as the minimum requirements are still satisfied.
The Total Credit Units for a Bachelor of Industrial Technology program must consist of a minimum of at least 154 credit units.

Section 12. Sample Curriculum Map and Course Description

Refer to **Annex II (A.3, B.3, and C.3)** for the Minimum Program Outcomes and Sample Curriculum Map. The HEI will have to develop its own Curriculum Map.

Annex II (A.4, B.4, and C.4) contains the Sample Course Specifications for the courses listed in the Sample Curriculum Map

Section 13. Course Syllabus

The Course Syllabus must contain the following minimum components:

13.1 General Course Information (Course Number/Code, Course Title, Course Description, Credit Units, Prerequisites)
13.2 Links to Program Outcomes
13.3 Course Outcomes
13.4 Course Outline (including Unit Outcomes)
13.5 Teaching and Learning Activities
13.6 Assessment Methods
13.7 Final Grade Evaluation

13.8 Learning Resources
13.9 Course Policies and Standards
13.10 Effectivity and Revision Information

See **Annex III** for a Sample Course Syllabus.

ARTICLE VI
REQUIRED RESOURCES

The primary responsibility in the preparation of technologists within a college or university shall be exercised by a clearly defined and organized administrative and instructional unit such as a college, an institute, a school, a department, or a division of technology or industrial technology.

Sec. 14 Administration

The administrator of the industrial technology program must provide academic governance and leadership by exerting efforts to achieve the program's educational objectives and program outcomes. As such, there shall be a full-time dean and a full-time department head or program chair/coordinator who are adept in the principles of outcomes-based education and are trained to implement the elements of OBE and OBTL.

14.1 Dean / Department Head / Program Coordinator

A Dean / Department head / Program coordinator shall be employed and assigned full–time to provide leadership, management, and administration to the industrial technology program of the Higher Education Institution and shall have the following qualifications:

14.1.1 Qualifications of the Dean / Department head / Program Coordinator

a. Full-fledged Master's Degree holder in the related field or preferably a Doctorate Degree (DTE, Ph.D., EdD, DIT) or in any of the related areas of specialization in the program offered.

b. With at least three (3) years of very satisfactory teaching experience in industrial technology/ technical teacher education/ engineering.

c. With at least three (3) years of very satisfactory technical supervisory experience.

14.1.2 The Dean / Department head / Program coordinator shall render full time service and who carries a regular teaching load in accordance with the institutional policy.

14.1.3 Responsibilities of the Dean

The Dean shall have the following functions and responsibilities:

a. Assists in the formulation of institutional policies;

b. Exercises educational leadership and administration among the technology faculty and staff by:

b.1. Initiating and instituting faculty and staff development programs;

b.2. Recommending the appointment, promotion, or separation of faculty and non–teaching personnel in the college; preparing and recommending the teaching load of the faculty members; and directing and assigning them to advise students in their program of studies.

b.3. Coordinates and facilitates student personnel services and practicum experiences;

b.4 Plans a program of curriculum development with the assistance of qualified faculty members;

b.5 Institutes a definite program of supervision and of other administrative support services aimed at upgrading the quality of Instruction;

b.6 Assists in the budget preparation and financial management of the program;

b.7 Initiates programs in research, extension, and production services through networking, linkages, consortia, etc., and any appropriate modes.

14.1.4 **Duties and Responsibilities of the Program Coordinator / Chair**

1. Assume a leadership role in working towards the improvement of instructional practices, giving special assistance to the new faculty;

2. Assist the school administration and faculty with the promotion and implementation of supervision practices;

3. Coordinate, plan, assign academic loads, and articulate curriculum;

4. Prepare a year-end report that summarizes activities, procedures, and programs that are significant to the operation of the assigned subject areas for current and subsequent years;

5. Maintain effective communication with other Department Heads;

6. Ensure the availability of help and advice to subordinates who may seek aid in connection with personal or

professional difficulties, and be aware of the sources of such help within the College;

7. Supports Staff Development, initiates evaluation, and supervises instruction;

8. Coordinates research, extension and facilitate production activities;

9. Assists procurement of supplies, materials, and equipment;

10. Arrange the chairs sessions of faculty within each of the assigned areas;

11. Responsible for maintaining harmony, goodwill, and cooperation among the members of assigned subject areas;

12. Discharge other functions assigned by the Dean to the faculty.

Sec. 15 Faculty

Members of the faculty shall have academic preparation and experience appropriate to teaching technology courses.

15.1 Qualifications

a. Faculty teaching general education and BINDTECH courses shall be a holder of an appropriate master's degree related to teaching his major field of specialization.

b. Shall have at least one (1) year of very satisfactory teaching experience in any technical–vocational or technological institution.

c. Shall have at least one (1) year of relevant industrial experience.

d. Load/Employment Status

d.1 At least 60% of the technical load of the industrial technology courses shall be taught by full–time instructors in the institution; and

d.2 The regular teaching load of the industrial technology faculty shall be in accordance with the institutional policy.

15.2 Faculty Development Plan

A faculty development plan shall be developed and implemented by the institution. There shall be sufficient funds allotted to support the faculty members in pursuing graduate studies and professional training or seminars. An assessment mechanism shall be developed to evaluate the faculty development on a regular basis.

a. Programs

a.1 Each administrator and the full-time faculty member shall be encouraged to participate in a school-approved program of professional development;

a.2 Every full-time faculty member shall be encouraged to attend professional meetings, workshops, and conferences;

a.3 Each full-time faculty member should have a career-path development program.

Section 16. Library and Other Learning Resources

Library personnel, facilities, and holdings shall conform to existing CHED requirements for libraries which are embodied in CHED Memorandum Order No. 22, s. 2021, "Minimum Requirements for Libraries of Higher Education Institutions Common to All Programs". The library must maintain a collection of updated and appropriate /suitable textbooks and references used for the core courses in the curriculum. Library resources should complement curriculum delivery to optimize the achievement of the program outcomes for the Bachelor of Industrial Technology program.

Section 17. Laboratory and Physical Facilities

In addition to the required laboratories and facilities for general education, the following shall be provided:

a. Laboratory facilities and equipment shall be maintained and regularly calibrated within the institution.
b Specialized laboratories in major courses shall be maintained with appropriate and modern facilities.
d. The technology facilities and requirements shall conform with the training standards and regulations set by appropriate authorities.

Refer to **Annex IV** for the laboratory equipment and resources required for the program.

Section 18. Admission and Retention

Higher Education Institutions must have an admission and retention policy.

ARTICLE VII
COMPLIANCE OF HEIs

Using the ***CHED Implementation Handbook for OBE and ISA*** as a reference, an HEI shall develop the following items which will be submitted to CHED when they apply for a permit for a new program or the approval of the transformation of existing programs and to outcomes-based framework:

Sec. 19 The complete set of program outcomes, including its proposed additional program outcomes.

Sec. 20 Its proposed curriculum, and its justification including a curriculum map.

Sec. 21 Proposed performance indicators for each outcome. Proposed measurement system for the level of attainment of each indicator.

Sec. 22 Proposed outcomes-based syllabus for each course.

Sec. 23 Proposed system of program assessment and evaluation

Sec. 24 Proposed system of program Continuous Quality Improvement (CQI).

ARTICLE VIII
TRANSITORY, REPEALING, and EFFECTIVITY PROVISIONS

Section 25. Transitory Provision

All private HEIs, state universities and colleges, and local universities and colleges with existing authorization to operate the Bachelor of Industrial Technology program are hereby given a period of three (3) years from the effectivity thereof to fully comply with all the requirements in this CMO. However, the prescribed minimum curricular requirements in this CMO shall be implemented starting AY 2023-2024.

Section 26. Sanctions

For violation of this Order, the Commission may impose such administrative sanction as if may deem appropriate pursuant to the pertinent provisions of Republic Act (RA) No. 7722, in relation to Section 69 of BP 232, otherwise as the Higher Education Act of 1982, and the Manual of Regulations for Private Higher Education (MORPHE) per CMO 40, series of 2008 and other related laws.

Section 26. Repealing Clause

Any provision of this Order, which may thereafter be held invalid, shall not affect the remaining provisions.

All CHED issuances or part thereof inconsistent with the provision in this CMO shall be deemed modified or repealed.

Section 27. Effectivity Clause

This CMO shall take effect fifteen (15) days after its publication in the Official Gazette or in a newspaper of general circulation. This CMO shall be implemented beginning AY 2023-2024.

Quezon City, Philippines September 5, 2023.

For the Commission:

SGD.
J. PROSPERO E. DE VERA III, DPA
Chairman
Commission on Higher Education

ANNEXES

ANNEX I – Competency Standards for the Bachelor of Industrial Technology
ANNEX II – Curriculum
- Curriculum Component (A.1, B.1, C.1)
- Sample Program of Study (A.2, B.2, C.2)
- Minimum Program Outcomes and Sample Curriculum Map (A.3, B.3, C.3)
- Sample Course Specifications (A.4, B.4, C.4)

ANNEX III – Sample Course Syllabus
ANNEX IV – Laboratory Requirements

BACHELOR OF INDUSTRIAL TECHNOLOGY (BIndTech)

ANNEX I

COMPETENCY STANDARDS FOR THE BACHELOR OF INDUSTRIAL TECHNOLOGY PROGRAM

Graduates of the Bachelor of Industrial Technology program are the technologists who are:

A. Technicians/Skilled Worker
   a. can perform tasks independently without supervision, and
   b. has the mastery of performance standards that are required in the Technician Competency Skills Assessment.

B. Industry supervisors and managers
   a. can perform management functions in industrial organizations; and
   b. can contribute to the Total Quality Management (TQM) at industrial organizations

C. Industry consultant and technologist
   a. can conduct technological innovations to solve problems in industry; and
   b. can perform higher skills required by industries

D. Technology developer and innovator
   a. can create innovative and market-driven products; and
   b. can develop highly-marketable technologies

ANNEX II- CURRICULUM

CURRICULUM COMPONENT -- (A.1, B.1, C.1)

SAMPLE PROGRAM OF STUDY -- (A.2, B.2, C.2)

MINIMUM PROGRAM OUTCOMES AND SAMPLE CURRICULUM MAP -- (A.3, B.3, C.3)

SAMPLE COURSE SPECIFICATION -- (A.4, B.4, C.4)

Program Majors:

A. **BACHELOR OF INDUSTRIAL TECHNOLOGY** –Automotive Technology
B. **BACHELOR OF INDUSTRIAL TECHNOLOGY** - Electrical Technology
C. **BACHELOR OF INDUSTRIAL TECHNOLOGY** - Electronics Technology

A. BACHELOR OF INDUSTRAL TECHNOLOGY –with major in Automotive Technology (BIndTech-AT)

A.1 CURRICULUM COMPONENT for the BIndTech -AT

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
I. TECHNICAL COURSES			
A. Math and Science Courses			
Comprehensive Mathematics	5	0	5
Chemistry for Industrial Technologists	2	3	3
Physics for Industrial Technologists	2	3	3
Sub-total	**9**	**6**	**11**
B. Applied Courses			
Introduction to Information Technology	2	3	3
Computer Programming	2	3	3
Industrial Drawing	1	3	2
Materials Technology Management	3	0	3
Quality Control and Assurance	3	0	3
Industrial Organization and Management	3	0	3
Industrial Psychology	3	0	3
Technopreneurship	3	0	3
Production Management	3	0	3
Foreign Language	3	0	3
Sub-total	**26**	**9**	**29**
C. Professional Courses			
Occupational Safety and Health	3	0	3
Fundamentals of Automotive Technology	3	0	3
Automotive Electrical System	2	3	3
Automotive Electronics	2	3	3
Automotive Computer Aided Design	1	3	2
Power Train, Conversion System	2	3	3

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
Small Engine Repair and Motorcycle Servicing	2	3	3
Car Care Servicing, Emission Control, and Tune-up	2	3	3
Body Repair and Painting	2	3	3
Engine Overhauling and Performance Testing	2	3	3
Hybrid and Electric Vehicle	2	3	3
Automotive LPG System	2	3	3
Automotive Air Conditioning	2	3	3
Body Management and Underchassis Electronic Control System	2	3	3
Driving Education	2	3	3
Electronics Engine Management Control System	3	0	3
Project Study 1 with Intellectual Property Rights	2	3	3
Project Study 2	2	3	3
Student Internship Program 1	0	600	6
Student Internship Program 2	0	600	6
Sub-total	**38**	**1245**	**65**
Total Technical Courses	**73**	**1260**	**105**
II. NON-TECHNICAL COURSES			
D. Required General Education			
Understanding the Self	3	0	3
Readings in the Philippine History	3	0	3
The Contemporary World	3	0	3
Mathematics in the Modern World	3	0	3
Purposive Communication	3	0	3
Art Appreciation	3	0	3
Science, Technology and Society	3	0	3

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
Ethics	3	0	3
Sub-total	**24**	**0**	**24**
E. General Education Electives			
GE Elective 1	3	0	3
GE Elective 2	3	0	3
GE Elective 3	3	0	3
Sub-total	**9**	**0**	**9**
F. Mandated Course			
Life and Works of Rizal	3	0	3
Sub-total	**3**	**0**	**3**
G. Physical Education			
PATHFIT 1	2	0	2
PATHFIT 2	2	0	2
PATHFIT 3	2	0	2
PATHFIT 4	2	0	2
Sub-total	**8**	**0**	**8**
H. National Service Training Program			
NSTP 1	3	0	3
NSTP 2	3	0	3
Sub-total	**6**	**0**	**6**
Total Non-Technical Courses	**50**	**0**	**50**
GRAND TOTAL	**123**	**1260**	**155**

SUMMARY

BACHELOR OF INDUSTRIAL TECHNOLOGY (BINDTECH-AT)

Classification / Field	Total No. of Hours		Total No. of Units
	Lecture	**L/T/FW/D**	
I. TECHNICAL COURSES			
A. Mathematics and Science Courses	9	6	11
B. Applied Courses	23	9	29
C. Professional Courses	38	1245	65
Sub-Total	**73**	**1260**	**105**
II. NON-TECHNICAL COURSES			
A. Required General Education Courses	24	0	24
B. General Education Electives	9	0	9
C. Mandated Course	3	0	3
D. Physical Education	8	0	8
E. National Service Training Program	6	0	6
Sub-Total	**50**	**0**	**50**
GRAND TOTAL	**123**	**1260**	**155**

A.2 SAMPLE PROGRAM OF STUDY for the BIndTech-AT

FIRST YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Occupational Health and Safety	3	0	3	None
Fundamentals of Automotive Technology	3	0	3	None
Automotive Electrical System	2	3	3	None
Chemistry for Industrial Technologists	2	3	3	None
Industrial Drawing	1	3	2	None
Understanding the Self	3	0	3	None
Mathematics In the Modern World	3	0	3	None
PATHFIT 1	2	0	2	None
National Service Training Program 1	3	0	3	None
Total	**22**	**9**	**25**	

FIRST YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Automotive Electronics	2	3	3	Automotive Electrical system
Small Engine Repair and Motorcycle Servicing	2	3	3	Fundamentals of Automotive Technology
Car Care Servicing, Emission Control, and Tune-up	2	3	3	Fundamentals of Automotive Technology
Automotive Computer-Aided Design	1	3	2	Industrial Drawing
Introduction to Information Technology	2	3	3	
Comprehensive Mathematics	5	0	5	
PATHFIT 2	2	0	2	PATHFIT 1
National Service Training Program 2	3	0	3	NSTP 1
Total	**19**	**15**	**24**	

SECOND YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Body Repair and Painting	2	3	3	None
Power Train and Conversion System	2	3	3	None
Automotive LPG System	2	3	3	Fundamentals of Automotive Technology Automotive Electrical system
Automotive Air Conditioning	2	3	3	Fundamentals of Automotive Technology Automotive Electrical System
Physics for Industrial Technologists	2	3	3	
GE Elective 1	3	0	3	
Ethics	3	0	3	
PATHFIT 3	2	0	2	PATHFIT 2
Total	**18**	**15**	**23**	

SECOND YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Engine Overhauling and Performance Testing	2	3	3	Fundamentals of Automotive Technology
Hybrid and Electric Vehicle	2	3	3	Fundamentals of Automotive Technology Automotive Electrical System
Driving Education	2	3	3	
Art Appreciation	3	0	3	
Readings in the Philippine History	3	0	3	
The Contemporary World	3	0	3	
Materials Technology Management	3	0	3	
Quality Control and Assurance	3	0	3	
PATHFIT 4	2	0	2	PATHFIT 3
Total	**23**	**9**	**26**	

THIRD YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Body Management and Underchassis Electronic Control System	2	3	3	Fundamentals of Automotive Technology Automotive Electrical System
Project Study 1 with Intellectual Property Rights	2	3	3	
Industrial Organization and Management	3	0	3	
Industrial Psychology	3	0	3	
Purposive Communication	3	0	3	
GE Elective 2	3	0	3	
Science, Technology, and Society	3	0	3	
Computer Programming	2	3	3	
Total	**21**	**9**	**24**	

THIRD YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Electronics Engine Management Control System	3	0	3	Fundamentals of Automotive Technology, Automotive Electrical System Automotive Electronics
Project Study 2	2	3	3	3rd Year Standing
Technopreneurship	3	0	3	3rd Year Standing
Production Management	3	0	3	None
Foreign Language	3	0	3	None
GE Elective 3	3	0	3	None
Life and Works of Rizal	3	0	3	
Total	**20**	**3**	**21**	

FOURTH YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Student Internship Program 1	0	600	6	Completed Academic Requirements
Total			**6**	

FOURTH YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Student Internship Program 2	0	600	6	SIP 1
Total			**6**	

A.3 MINIMUM PROGRAM OUTCOMES AND SAMPLE CURRICULUM MAP for the BINDTECH-AT

Program Outcomes

Graduates of the BINDTECH program must have the following:

a. Ability to analyze broadly defined industrial technology processes by using analytical tools that enhance creativity, innovativeness, and intellectual curiosity to improve methods, processes, and systems that meet the industry standards

b. Ability to design and implement broadly defined industrial systems, components, products, or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards

c. Ability to apply appropriate techniques, resources, and state-of-the-art industrial technology tools to meet current industry needs and use these modern tools and processes to improve and increase entrepreneurial activities upholding the safety and health standards of business and industry

d. Ability to communicate with diverse groups of clienteles the appropriate cultural language with clarity and persuasion, in both oral and written forms, including understanding and giving of clear instructions, high comprehension level, effectiveness in delivering presentations and writing documents, and articulating technological innovation outputs

e. Ability to develop leadership and management skills in a team-based environment by making informed decisions, keeping the team motivated, acting and delegating responsibility, and inspiring positive changes in the organization by exercising responsibility with integrity and accountability in the practice of one's profession

f. Ability to practice the moral responsibilities of an industrial technologist to manage and balance wider public interest and uphold the norms and safety standards of the industrial technology profession

g. Ability to demonstrate enthusiasm and passion for continuous personal and professional development in broadly defined industrial technology and effecting positive changes in the entrepreneurial and industrial endeavor

h. Ability to recognize the need for, and an ability to engage in lifelong learning

Legend:

Code	*Descriptor*	*Definition*
I	Introductory	A course that provides the foundational understanding of the outcome
E	Enabling	A course that strengthens the outcome
D	Demonstrating	A course that exhibits or shows the outcome

TECHNICAL COURSES

a. Math and Science Courses

Course	*Relationship to Student Outcomes*							
	A	b	c	d	e	f	g	h
Comprehensive Math	I							
Chemistry for Industrial Technologist	I	I						
Physics for Industrial Technologist	I	I						

b. Applied Courses

Course	*Relationship to Student Outcomes*							
	A	b	c	d	e	f	g	h
Introduction to Information Technology	I	I						
Computer Programming	I	I						
Industrial Drawing		I		I				
Materials Technology Management			I			I		
Quality Control and Assurance			I			I		
Industrial Organization and Management Practices				I	I			
Industrial Psychology				I		I		
Technopreneurship				I			E	
Production Management			I		I			
Foreign Language				I				

c. Professional Courses

Course	Relationship to Student Outcomes							
	a	b	c	d	e	f	g	h
Technology Courses								
Occupational Safety and Health Practices			I	I		E		E
Fundamentals of Automotive Technology	I	E	E					
Automotive Electrical System	I	D	D					
Automotive Electronics	I	D	D					
Automotive CAD	I	D	D					
Power Train, Conversion System	D	D	D					
Small Engine Repair and Motorcycle Servicing	D	D	D					
Car Care Servicing, Emission Control and Tune-up	D	D	D					
Body Repair and Painting	D	D	D					

Engine Overhauling and Performance Testing	D	D	D					
Hybrid and Electric Vehicle	D	D	D					
Automotive LPG System	D	D	D					
Automotive Air Conditioning	D	D	D					
Body Management and Underchassis Electronic Control System	D	D	D					
Driving Education	D	D	D					
Electronics Engine Management Control System	D	D	D					
Project Study 1 with Intellectual Property Rights		D		D	D	D	D	
Project Study 2		D		D	D	D	D	
Student Internship Program 1				E	E	E	E	
Student Internship Program 2				D	D	D	D	

NON-TECHNICAL COURSES

d. Required General Education

Course	***Relationship to Student Outcomes***							
	A	**b**	**c**	**d**	**e**	**f**	**g**	**h**
Understanding the Self								E
Readings in the Philippine History		I						
The Contemporary World		E						
Mathematics in the Modern World	I							
Purposive Communication				E				
Art Appreciation				E				
Science, Technology and Society		E						
Ethics						E		

e. General Education Electives

Course	***Relationship to Student Outcomes***							
	A	**b**	**c**	**d**	**e**	**f**	**g**	**h**
Elective 1							I	
Elective 2							I	
Elective 3							I	

f. Mandated Course

Course	*Relationship to Student Outcomes*							
	A	b	c	d	e	f	g	h
Life and Works of Rizal				E				

g. Physical Education

Course	*Relationship to Student Outcomes*							
	A	b	c	d	e	f	g	h
PATHFIT 1								E
PATHFIT 2								E
PATHFIT 3								E
PATHFIT 4								E

h. National Service Training Program

Course	*Relationship to Student Outcomes*							
	A	b	c	d	e	f	g	h
NSTP 1								E
NSTP 2								E

A.4 SAMPLE COURSE SPECIFICATIONS for the BIndTech-AT

TECHNICAL COURSES

a. Mathematics and Science Courses

Course Name	**COMPREHENSIVE MATH**
Course Description	This course covers discussion on the circle and conic sections and includes graphing conic sections. It also includes discussion on systems of non-linear equations, sequences and series, arithmetic sequences and series, geometric sequences and series, principle of mathematical induction, and binomial theorem. It also covers discussion on the unit circle, circular functions, trigonometric identities, inverse trigonometric functions, and polar coordinate system.
Number of Units for Lecture and Laboratory	5 units lecture
Number of Contact Hours per Week	5 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• Conic sections
	  - Circle
	  - Ellipse
	  - Parabola
	  - Hyperbola
	  - Degenerate cases
	• Systems of Nonlinear Equations
	  - Series
	  - Sequence
	• Mathematical induction
	• Binomial theorem
	• Circular function
	• Trigonometric identities
	• Inverse trigonometric functions
	• Polar coordinate system

Course Name	**CHEMISTRY FOR INDUSTRIAL TECHNOLOGISTS**
Course Description	The course introduces the students to general concepts of chemistry through classroom and laboratory experience. It emphasizes the chemical bonds, compound formations, chemical reactions and symbolic representations, the mole concept and its applications, gas laws, solutions and colloids, acids, bases and salts, and chemical equilibrium. The laboratory part includes activities and experiments aimed to strengthen chemical principles and concepts learned in the lecture part and develop students' skills in the use of common laboratory apparatus. This also includes discussions on the proper use of common laboratory apparatus, first aid in the laboratory,

	systematic presentation of laboratory, data, and application of the scientific method.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Matter and its properties • Measurements • Atoms, Molecules and Ions • Stoichiometry • Gases • Electronic Structure of an Atom • Electronic Structure of an Atom and Periodicity • Chemical Bond/ Ionic Bond • Covalent Bond • Organic Compound • Intermolecular Forces /Liquids and Solids • Physical Properties of solution • Thermochemistry • Chemical Kinematics • Chemical Thermodynamics • Chemical Equilibrium • Acids, Bases Equilibria and Salt Equilibrium
Laboratory Equipment	See Annex IV

Course Name	**PHYSICS FOR INDUSTRIAL TECHNOLOGIST**
Course Description	This is an undergraduate level course in Physics for the Non-STEM courses that covers Mechanics, Waves, Thermodynamics, Electricity, Magnetism, Optics, and Modern Physics. The course gives focus on the conceptual and theoretical aspect of these topics and its applications in real-world problems.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Comprehensive Math
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Units, Physical Quantities, and Vectors • Motion • Newton's Laws of Motion and Applications • Work, Energy, and Energy Conservation • Momentum, Impulse, and Collisions

	• Rotational Motion • Fluid Mechanics • Periodic Motion, Mechanical Waves and Sound • Temperature and Heat • Ideal Gases and The Laws of Thermodynamics • Electric Charge, Electric Fields, and Gauss' Law • Electric Potential, Capacitance and Dielectrics • Current, Resistance and Electromotive Force • Direct Current Circuits • Magnetism • Light and Geometric Optics • Relativity
Laboratory Equipment	See Annex IV

b. Applied Courses

Course Name	**INTRODUCTION TO INFORMATION TECHNOLOGY**
Course Description	This course is designed to teach the fundamentals of computer hardware and software, the Internet and the Web, and concepts such as security, networking, and the responsibilities of an IT professional.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Information Technology, the Internet, and You • The System Unit • Input and Output • Secondary Storage • System Software • The Internet, the Web, and Electronic Commerce • Basic Application Software • Specialized Application Software • Communications and Networks • Privacy, Security, and Ethics
Laboratory Equipment	See Annex IV

Course Name	**COMPUTER PROGRAMMING**
Course Description	The course provides the student with a sound background in the principles of fundamentals in procedural programming. The course helps the student to develop analytical thinking through understanding logic formulation using the techniques in flowcharting. It encompasses a structured programming language, its environment, and control structures. The course aids the student in solving simple to complex

	problems by developing programs using a structured programming language.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Introduction to Information Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Program Logic Formulation – Concepts and Decision • PLF – Loops and Trailers • PLF – Arrays • Understanding Structured Programming and its Environment • Selection Constructs – If-Else / Nested Ifs, Switch • Looping Constructs – For, While, Do-While Loop • Arrays – Single and Multi- Dimension • Functions • Recursion • Pointers
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL DRAWING**
Course Description	This course deals in acquiring fundamental skills in conventional technical drawing its analogy in computer-aided drawing following the standards system of measurements and annotations to produce projection drawings to include approximate representation (isometric) of an object and rendering.
Number of Units for Lecture and Laboratory	1 units lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Conventional Technical Drawing - Conventional Technical Drawing Introduction - Pictorial Drawings with Annotations and Rendering - Working Drawing Management Production • Computer-Aided Drawing - AutoCAD Introduction, Interface Exploration and System Customization - AutoCAD Orthographic Drawing - 2D (Isometric) and 3D Modeling - CAD Drawing Management and Production
Laboratory Equipment	See Annex IV

Course Name	**MATERIALS TECHNOLOGY MANAGEMENT**
Course Description	This course provides a realistic insight on how individual become effective and productive manager. It also deals with the theories, principles and practices in production and processing materials. It includes the study of materials, industry and other engineering materials used for production of manmade items and machine components. It analyzes the different processes involved in the production of parts and components of mechanism. The course also covers safety production and precautions relative to the material process/ or material handling.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Material technology management • Technology and Innovation • Establishment of Technology • Strategizing • Profiting Innovation • Protecting Innovation • Humanizing Innovation • Product development Process • Materials Technology Process • Innovation Failure - Fracture - Fatigue - Corrosion - Wear • Environment

Course Name	**QUALITY CONTROL AND ASSURANCE**
Course Description	The course is designed to provide a fundamental, yet comprehensive coverage of quality control concepts, which lead to sound understanding of the basic principles of quality control. It presents, in general term, the modern field of quality control as a body of managerial, technological, behavioral and economic knowledge, together with organized application of the knowledge to practical improvements of industrial operations.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program

Course Outcomes	To be identified by the program
Course Outline	• Introduction to Quality Control and the Total Quality System • Evolution of Quality Control • Quality • Quality Control • Quality Assurance • Quality Circles • Benefits of Quality Control • Quality and Reliability • Quality Improvement • Quality Costs • Control Charts for Variables and Attributes • Graphical Methods of Data Presentation and Quality Improvement • Deming's Philosophy of Quality • Taguchi Methods in Design and Quality Improvement

Course Name	**INDUSTRIAL ORGANIZATION AND MANAGEMENT**
Course Description	This subject aims to develop student's understanding of basic concepts of the activities included in a manufacturing plant and his relationship to them in an industrial technology activity. Topics covered are methods of technology and motion of study, work measurement techniques, wage and salary plans, job evaluation and wage administration, control of production, control of quality and cost, including budgetary control.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to industries and manufacturing. • Industries management and planning - Organizational structure - Operational Analysis - Risk and forecasting • Financing and Budgeting • Research and Development • Physical Facilities • Production and workflow planning • Productivity Improvement • Quantity Control • Quality Control • Labor Management Relations • Job and Wages • Marketing • Challenges to Industrial organization and management - Environmental issues • Industry and community concerned.

Course Name	**INDUSTRIAL PSYCHOLOGY**
Course Description	This course is an application of the principles and theories of learning, emotion, psychological testing, motivation, and clinical measurements as applied to non-machine system and relationships.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Industrial Psychology • Fundamentals of Human Behavior • Organizational Behavior • Dealing with Individuals • Dealing with Groups • Organizational in the Organization

Course Name	**TECHNOPRENEURSHIP**
Course Description	Technopreneurship is a philosophy, a way of building a career or perspective in life. The course covers the value of professional and life skills in entrepreneurial thought, investment decisions, and action that students can utilize in starting technology companies or executing research and development projects in companies as they start their careers. The net result is a positive outlook towards wealth creation, high value adding, and wellness in society.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• Introduction
	  - Entrepreneurial Mindset
	  - Innovation and Ideas
	  - Products and Services
	  - Team Formation
	• Customer
	• Value Proposition
	• Market Identification and Analysis
	• Creative Competitive Advantage
	• Business Models
	• Introduction to Intellectual Property
	• Execution and Business Plan
	• Financial Analysis and Accounting Basics

	• Raising Capital • Ethics, Social Responsibility and Globalization

Course Name	**PRODUCTION MANAGEMENT**
Course Description	It is a three-unit course which primarily discusses the principles, concepts and basic problems affecting the manufacturing and non-manufacturing firms. It also includes the methods, strategies and application of various economical and mathematical tools in solving the production and operation related problems.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to POM • Competitiveness, strategy and productivity • Product and service design • Capacity planning • Process selection and facility layout • Designing of work system • Location planning and analysis • Inventory management • Project management

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Course Name	**FOREIGN LANGUAGE**
Course Description	This course enables the learners to have a functional grasp of grammar of a foreign language for communicative purposes. It also exposes the learners with the history, literature and culture of this language. The learners will be equipped with the different language skills and vocabulary needed to translate and interpret various types of communications.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Use of foreign language in formal and informal communicative situations

	• Interpretation of information conveyed in oral and written communicative contexts • Application of language skills in translation, academe, business, and technical support. • Communicative strategies appropriate in formal and informal situations • Language skills in various socio-cultural settings

c. Professional Courses

Course Name	**OCCUPATIONAL SAFETY AND HEALTH**
Course Description	The course introduces the students to basic occupational safety and health. The students will learn safe work practices and principles in industries and to identify and prevent illnesses, accidents, and injuries associated in with work. The course will also cover the Philippine governing laws on OSH and tackles key concepts, principles, and practices that are foundational knowledge requirements applicable in almost all industries. It also focuses on the identification of components of effective OSH programs and demonstration of some skills in identifying hazards and corresponding control measures at the workplace.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• The Basic Occupational Safety and Health (BOSH) Framework • OSH Situationer • Unsafe Acts and Conditions • Housekeeping • Fire Safety • Electrical Safety • Machine Safety • Materials Handling and Storage • Personal Protective Equipment (PPE) • Accident Investigation • Industrial Hygiene and Control Measure • Safety and Health Inspection • OSH Administration and Programming

Course Name	**FUNDAMENTALS OF AUTOMOTIVE TECHNOLOGY**
Course Description	This course deals with the basic principles of thermodynamics, which serve as the fundamental of the gas cycle employed in the operation of engine. It also deals with the construction, basic operation, functions of components parts if engine operation and performance of gasoline and diesel engine.

Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• 5S housekeeping • Workshop safety rules and regulation • Tools and equipment • Automobile body designs and description • Engine nomenclature • Engine systems • Undercarriage systems • Power trains • Engine electrical • Body electrical
Laboratory Equipment	See Annex IV

Course Name	**AUTOMOTIVE ELECTRICAL SYSTEM**
Course Description	This course deals with the basic principles in applied electricity in automotive. It also includes the circuits in electrical system of automobile from body system to engine systems. The course equips the student with an entry-level skill required by the industry as an automotive electrician.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Work • Electrical Theories • Electrical Components and Meters • Wiring and Diagrams • Automotive Batteries • Light Circuits • Analog Instruments, Warning Lights • Starting Systems • Charging Systems • Electrical Accessories • Ignition Systems

Laboratory Equipment	See Annex IV

Course Name	**AUTOMOTIVE ELECTRONICS**
Course Description	This course focuses in semiconductor components and integrated circuits, digital fundamentals, microcomputer systems, computerized engine controls, and electronic test equipment as applied to automotive technology.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Automotive Electrical System
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Current, Voltage and Resistance • Conductors and Insulators • Resistors • Capacitors • Inductors • Transformers • Hand tools • Multi-meters • PCB • Soldering • Principles and operation in Automotive electronic components a. Electronic ignition system - Inductive - Hall effect - Optical b. Electronic sensors c. ECM
Laboratory Equipment	See Annex IV

Course Name	**AUTOMOTIVE CAD**
Course Description	Automotive Design comprises of various courses, which includes industry specific CAD software that are used by Automotive Designer for accomplishing preliminary tasks like designing, manufacturing and operating automobiles.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Industrial Drawing
Co-requisites	None
Program Outcomes	To be identified by the program

Course Outcomes	To be identified by the program
Course Outline	• Introduction • Orthographic drawings • Parametric drawings • Symbol creation using block • BOM / Joinery details creation • Isometric drawings • Perspective drawings • Annotations and Dimensions • Automotive shop lay out
Laboratory Equipment	See Annex IV

Course Name	**POWER TRAIN AND CONVERSION SYSTEM**
Course Description	This course provides the students the technical knowledge and skills in troubleshooting repair and maintenance of different aspects of the auto power train. This course covers the clutch assembly, transmission auxiliary, the drive lines and driving axle. It includes the use and maintenance of mechanic hand tools, testing instrument devices.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamentals of Automotive Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Power train principles and components • FWD • RWD • AWD • Clutch system and operation • Transmission/transaxles principles and operation • Manual transaxles • Automatic transaxles • Differential system • Conventional differential • Limited slip differential
Laboratory Equipment	See Annex IV

Course Name	**SMALL ENGINE REPAIR AND MOTORCYCLE SERVICING**
Course Description	This course deals with the basic fundamentals of motorcycle and small engine operation and function. It also deals with testing, servicing motorcycle electrical system and engine overhauling.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory

Prerequisites	Fundamentals of Automotive Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Workshop safety • How to use parts manual • Workshop equipment and tools • Conversion of units • Bolts and nuts • Measuring tools • Basic engine concept • Valve timing diagram • Lubrication • Air induction • Tires • Brakes • Dimensions • Electrical components
Laboratory Equipment	See Annex IV

Course Name	**CAR CARE SERVICING, EMISSION CONTROL AND TUNE-UP**
Course Description	This course deals with the principle and techniques in conducting preventive maintenance in automotive vehicles both gasoline and diesel following the required Periodic Maintenance Schedule (PMS). It enables the students to get familiarize in the use of service manual and acquired skills based upon standard requirements of the industry.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamentals of Automotive Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• Equipment operation and safety
	• Measuring tools and equipment
	• Receiving and diagnosis
	• PMS checklist
	• Mileage/periodic activities
	• Engine tune up
	• Engine diagnostic activities
	• Emission testing
	  - Gas analyses
	  - Opacity test
	• Pre-Delivery Inspection (PDI)

Laboratory Equipment	See Annex IV

Course Name	**BODY REPAIR AND PAINTING**
Course Description	This course deals basic tools, equipment, supplies and materials used in auto body repair and painting services. This will equip the students the basic techniques in auto body and chassis collision repair with hands on activity in performing jobs related to auto body repair and painting. This includes the observance and implementation of proper usage of PPE'S , tools and equipment's.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	none
Co-requisites	none
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Automotive fasteners and power tools. • Body repair tools usage demonstration. • Welding equipment and process. • Measuring structural damage and collision repair. • Body parts and plastic replacement. • Orientation in spray gun used and application of painting equipment's. • Paint mixing/ colour blending/coating • Solvent material/painting application and process • Painting finish evaluation
Laboratory Equipment	See Annex IV

Course Name	**ENGINE OVERHAULING AND PERFORMANCE TESTING**
Course Description	This course covers the related technical knowledge and jobs information which the students have to perform most of the time in auto engine repair. It also covers analysis of wear services and maintenance procedure, precision measurements of components, engine and components overhaul.
Number of Units for Lecture and Laboratory	2 units lecture; 2 units laboratory
Number of Contact Hours per Week	2 hours lecture; 6 hours laboratory
Prerequisites	Fundamentals of Automotive Technology
Co-requisites	none
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Workshop safety • Automotive tools and equipment • Measuring tools - Micrometer - Cylinder bore gauge - Depth gauge - Feeler gauge

	- Plastigage • Engine parts • Engine systems • Engine compression testing • Engine overhauling general procedures • Engine parts measurement - Bearing Oil clearance - Cylinder bore roundness - piston ring end clearance - piston ring side clearance - journal roundness - block and cylinder head flatness - valve face contact - valve stem warpage - valve spring tension • Engine Machining - Cylinder honing - Journal surfacing - Cylinder head surfacing - Block surfacing - Liner installation - Valve grinding and lapping • Assembly and performance testing
Laboratory Equipment	See Annex IV

Course Name	**HYBRID AND ELECTRIC VEHICLE**
Course Description	This course will provide a broad technical knowledge and practical expertise of hybrid and electric vehicle (HEV) technologies, analysis, design, component selection and sizing at both system and vehicle level.
Number of Units for Lecture and Laboratory	2 units lecture
Number of Contact Hours per Week	2 hours lecture
Prerequisites	Fundamental of Automotive Technology
Co-requisites	Automotive electronics
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Hybrid Electric Vehicle (HEV) • Hybridization of the Automobile • HEV Fundamentals • Plug-in Hybrid Electric Vehicles • Power Electronics in HEV • Batteries, Ultra capacitors, Fuel Cells, and Controls • Electric Machines and Drives in HEVs • Integration of Subsystems • Energy Management Strategies

Course Name	**AUTOMOTIVE LPG SYSTEM**
Course Description	This course deals with the alternative fuel/ LPG that involves knowledge and demonstration skills in parts and operation. It includes the basic function s of components in LPG system. The manipulative skills involves lay-outing/ installation of components and testing with the utmost observance of safety measures.
Number of Units for Lecture and Laboratory	2 units' lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamental of Automotive Technology
Co-requisites	Automotive electrical, OSH
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• the design safety features • the different generations of LPG system • selection criteria • component location • installation • commissioning and maintenance
Laboratory Equipment	See Annex IV

Course Name	**AUTOMOTIVE AIR CONDITIONING**
Course Description	This course covers the principles of refrigeration with emphasis on the particular problems of application to automotive air conditioning. The course also covers an automotive heating system which includes heater cores, blower motors, vent systems and the electronic controls for them. The students will learn how to use refrigeration recovery and charging equipment and will have hands-on experience in the laboratory with the equipment.
Number of Units for Lecture and Laboratory	2 unit's lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamentals of Automotive Technology
Co-requisites	Automotive Electrical
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation to shop safety. • Tools and recovery machine. • Design and construction of various A/C system • Theory of heat transfer • A/C components and its functions • Compressor classifications • Refrigerant concept and refrigerant used in automobile. • Electrical system • Retrofitting CFC 12 to 134-A • Airconditioning service

	• Refrigerant recovery machine operations
Laboratory Equipment	See Annex IV

Course Name	**BODY MANAGEMENT AND UNDERCHASSIS ELECTRONIC CONTROL SYSTEM**
Course Description	This course deals with the basic principles of electronic body management, repair, services and troubleshooting on electronically control unit. It includes features in underchassis components improving performance and stability of the automobile.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamental of Automotive Technology
Co-requisites	Automotive Electronics
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Advance lighting system • Electronic instrumentation • Electronic Control module • Auto theft system • Automatic door lock system • Keyless entry • Airbag system • Electronic climate control system • Electronically controlled steering system electric motor drive steering. - System layout and components. - Circuit • Anti – lock brake system (ABS) system and diagnosis. - System layout and components. - Circuit • Electronically controlled suspension system - System layout and components - Circuit
Laboratory Equipment	See Annex IV

Course Name	**DRIVING EDUCATION**
Course Description	This course deals with understanding of the basic concepts of driving education, developing safe driving attitudes and acquired skills to become a good driver.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamentals of Automotive Technology
Co-requisites	OSH

Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Perform routine check-up • Clean vehicle head • Report any minor troubles found and observe abnormalities • Perform "BLOWBAGS" check • Check pilot pin, pin lock, hose engagement (electrical, hydraulic, air pressure) • Check operating condition of panel control (instrument gauges, indicators and controls) of the vehicle • Check operating condition of air brake and steering control • Engage/set safety locks when parked • Re-conduct walk around inspection prior to turning off the engine • Identify traffic rules and regulations/ordinances implemented in different municipalities/cities • Wear appropriate driver outfit/ attire • Respond to / handle complaints • Obey and observe traffic rules and regulations • Identify and evaluate hazards and risks • Control hazards and risks • Maintain fitness for driving • Identify different types of emergency situations • Respond to accidents/ emergencies encountered • Report accidents/emergency situation to proper authority • Apply first aid • Provide needs of injured victim based on emergency
Laboratory Equipment	See Annex IV

Course Name	**ELECTRONICS ENGINE MANAGEMENT CONTROL SYSTEM**
Course Description	This course deals with the study of engine management control unit which include sensors, Controller, engine control strategies, engine design, engine management components, actuators, engine air flow, exhaust recirculation.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Fundamental of Automotive Technology
Co-requisites	Automotive Electronics
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to the computer ECM. • Body Computer System Diagnosis - Trouble codes - Entering diagnostics - Testing actuators - Testing sensors - Testing hall effect sensors - PROM replacement • Computer controlled ignition system • Diagnose electronic controlled ignition system

	- Inductive type - Hall effect - Optical - Distributor-less ignition DI ignition • Electronic fuel system and control • On Board Diagnostics and trouble codes
Laboratory Equipment	See Annex IV

Course Name	**PROJECT STUDY 1 WITH INTELLECTUAL PROPERTY RIGHTS**
Course Description	This course deals with the conceptualization of a project proposal based on the line of work/specialization of the student. It includes the study of research methodology as employed in applied research and the process of preparing a project report. The course also covers discussion of the different intellectual property rights such as patent, utility model, industrial design, copyright, trademark and trade secret. It also includes the governing intellectual property laws and an in-depth analysis of cases on IP violations and infringements as well as patent search and information strategies using various IP databases and the entire IP prosecution process.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Research • Intellectual Property Awareness and Orientation • Patent Search and Information Strategies • Introduction to Research: Research Problem and Objectives • Introduction to Research: Selecting the Best Solution • Conceptualizing Research Project Proposal • Project Proposal Writing • Research Ethics and Plagiarism • Proposal Oral Defense
Laboratory Equipment	Computer and any programming language and/or simulation software tool; materials, components and tools needed for prototype development and testing

Course Name	**PROJECT STUDY 2**
Course Description	The course deals with the project application wherein previous or new design shall be placed into actual prototypes, functional and operational in form and will be course for inspection and evaluation applying the requirements of good design and the criteria for design evaluation.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory

Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Project Study 1 with IPR
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Project Development • Revisions of Project Proposal • Prototype Development • Documentation • Test and Evaluation • Final Oral Defense • Submission of final document
Laboratory Equipment	Computer and any programming language and/or simulation software tool; materials, components and tools needed for prototype development and testing

Course Name	**STUDENT INTERNSHIP PROGRAM 1**
Course Description	This course aims to develop industrial competencies of the students through direct exposure to actual work, strengthening the skills acquired from school. Students shall develop and implement desirable work haBIndTech and attitude required of an effective and productive labor force.
Number of Units for Lecture and Laboratory	6 units
Minimum Number of Hours Required for Industry Training	600 hours per semester
Prerequisites	Completed Academic Requirements
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Presentation of Policies and Guidelines • Multidisciplinary Team Approaches • Assertions of Student's OJT in the company • Submission of Progress Reports • Completion of 600 hours • Submission of Final Report

Course Name	**STUDENT INTERNSHIP PROGRAM 2**
Course Description	This course exposes the students to the actual workplace applying the basic and advanced skills. The students will be made to work in the industry with added exposure to management and supervisory work situation.
Number of Units for Lecture and Laboratory	6 units

Minimum Number of Hours Required for Industry Training	600 hours per semester
Prerequisites	Student Internship Program 1
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Presentation of Policies and Guidelines • Multidisciplinary Team Approaches • Assertions of Student's OJT in the company • Submission of Progress Reports • Completion of 600 hours • Submission of Final Report • Final Oral Presentation

BACHELOR OF INDUSTRAL TECHNOLOGY with major in Electrical Technology – (BIndTech- ELT)

B.1 CURRICULUM COMPONENT for the BIndTech- ELT

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
I. TECHNICAL COURSES			
A. Math and Science Courses			
Comprehensive Math	5	0	5
Chemistry for Industrial Technologist	2	3	3
Physics for Industrial Technologist	2	3	3
Sub-total	**9**	**6**	**11**
B. Applied Courses			
Introduction to Information Technology	2	3	3
Computer Programming	2	3	3
Industrial Drawing	1	3	2
Material Technology Management	3	0	3
Quality Control and Assurance	3	0	3
Industrial Organization and Management	3	0	3
Industrial Psychology	3	0	3
Technopreneurship	3	0	3
Production Management	3	0	3
Foreign language	3	0	3
Sub-total	**26**	**9**	**29**
C. Professional Courses			
Occupational Safety and Health	3	0	3
Electricity and Electronics Principles	1	3	2
DC Circuits	1	3	2
Shop Processes, Tools and Equipment	1	3	2
AC Circuits	2	3	3
Philippine Electrical Code	2	0	2
Electrical Instruments and Measurement	2	3	3
Residential Wiring System	1	6	3

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
Industrial Motor Controllers	1	3	2
Electrical Machines	1	6	3
Logic Circuits	1	3	2
Power Production and Management Systems	1	3	2
Industrial Wiring System	1	6	3
Transmission and Distribution System	2	3	3
Programmable Logic Controllers	2	3	3
Electrical Computer Aided Design	1	3	2
Instrumentation and Process Control	2	3	3
Electro-Pneumatic Systems	2	3	3
Project Study 1 w/ IPR	2	3	3
Project Study 2	2	3	3
Student Internship Program 1	0	600	6
Student Internship Program 2	0	600	6
Sub-total	**31**	**1263**	**64**
Total Technical Courses	**66**	**1278**	**104**
II. NON-TECHNICAL COURSES			
D. Required General Education			
Understanding the Self	3	0	3
Readings in the Philippine History	3	0	3
The Contemporary World	3	0	3
Mathematics in the Modern World	3	0	3
Purposive Communication	3	0	3
Art Appreciation	3	0	3
Science, Technology and Society	3	0	3
Ethics	3	0	3
Sub-total	**24**	**0**	**24**
E. General Education Electives			
Elective 1	3	0	3

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
Elective 2	3	0	3
Elective 3	3	0	3
Sub-total	**9**	**0**	**9**
F. Mandated Course			
Life and Works of Rizal	3	0	3
Sub-total	**3**	**0**	**3**
G. Physical Education			
PATHFIT 1	2	0	2
PATHFIT 2	2	0	2
PATHFIT 3	2	0	2
PATHFIT 4	2	0	2
Sub-total	**8**	**0**	**8**
H. National Service Training Program			
NSTP 1	3	0	3
NSTP 2	3	0	3
Sub-total	**6**	**0**	**6**
Total Non-Technical Courses	**50**	**0**	**50**
GRAND TOTAL	**116**	**1278**	**154**

SUMMARY

BACHELOR OF INDUSTRIAL TECHNOLOGY
With major in Electrical Technology (BINDTECH-ELT)

Classification / Field	Total No. of Hours		Total No. of Units
	Lecture	L/T/FW/D	
I. TECHNICAL COURSES			
A. Math and Science Courses	9	6	11
B. Applied Courses	26	9	29
C. Professional Courses	31	1263	64
Sub-Total	**66**	**1278**	**104**
II. NON-TECHNICAL COURSES			
D. Required General Education Courses	24	0	24
E. General Education Electives	9	0	9
F. Mandated Course	3	0	3
G. Physical Education	8	0	8
H. National Service Training Program	6	0	6
Sub-Total	**50**	**0**	**50**
GRAND TOTAL	**116**	**1278**	**154**

B.2 SAMPLE PROGRAM OF STUDY (BIndTech- ELT)

FIRST YEAR – First Semester

Subjects	No. of Hours		Units	Pre-requisite/ Co-requisite
	Lecture	Lab		
Electricity and Electronics Principles	1	3	2	None
DC Circuits	1	3	2	None
Shop Processes, Tools, and Equipment	1	3	2	None
Occupational Safety and Health	3	0	3	None
Philippine Electrical Code	2	0	2	None
Residential Wiring Systems	1	6	3	None
Mathematics In the Modern World	3	0	3	None
Industrial Drawing	1	3	2	None
PATHFIT 1	2	0	2	None
NSTP 1	3	0	3	None
Total	**18**	**18**	**24**	

FIRST YEAR – Second Semester

Subjects	No. of Hours		Units	Pre-requisite/ Co-requisite
	Lecture	Lab		
AC Circuits	2	3	3	Electricity/Electronics Principles, DC Circuits
Industrial Wiring Systems	1	6	3	Residential Wiring Systems
Electrical Instruments and Measurements	2	3	3	Shop Processes, Tools, and Equipment
Electrical Machines	1	6	3	PEC, Electricity/Electronics Principles
Chemistry For Industrial Technologists	2	3	3	
Introduction To Information Technology	2	3	3	
PATHFIT 2	2	0	2	PATHFIT 1
NSTP 2	3	0	3	
Total	**15**	**24**	**23**	

SECOND YEAR – First Semester

Subjects	No. of Hours		Units	Pre-requisite/ Co-requisite
	Lecture	Lab		
Transmission and Distribution Systems	2	3	3	AC Circuit, Electrical Instruments, and Measurements
Industrial Motor Controllers	1	3	2	PEC, Industrial Wiring Systems
Power Production and Management Systems	1	3	2	Electrical Machines
GE Elective 1	3	0	3	
Comprehensive Math	5	0	5	
Ethics	3	0	3	
Physics For Industrial Technologists	2	3	3	
PATHFIT 3	2	0	2	PATHFIT 2
Total	**19**	**12**	**23**	

SECOND YEAR – Second Semester

Subjects	No. of Hours		Units	Pre-requisite/ Co-requisite
	Lecture	Lab		
Logic Circuits	1	3	2	Industrial Motor Controllers
Electrical Computer-Aided Design	1	3	2	Industrial Drawing, PEC
Programmable Logic Controllers	2	3	3	Industrial Motor Controllers
The Contemporary World	3	0	3	
Computer Programming	2	3	3	
Art Appreciation	3	0	3	
Materials Technology Management	3	0	3	
Quality Control and Assurance	3	0	3	
PATHFIT 4	2	0	2	PATHFIT 3
Total	**20**	**12**	**24**	

THIRD YEAR – First Semester

Subjects	No. of Hours		Units	Pre-requisite/ Co-requisite
	Lecture	Lab		
Electro-Pneumatic Systems	2	3	3	Programmable Logic Controllers
Understanding The Self	3	0	3	
Readings In Philippine History	3	0	3	
GE Elective 2	3	0	3	
Science, Technology, and Society	3	0	3	
GE Elective 3	3	0	3	
Industrial Psychology	3	0	3	
Project Study 1 with Intellectual Property Rights	2	3	3	
Total	**22**	**6**	**24**	

THIRD YEAR – Second Semester

Subjects	No. of Hours		Units	Pre-requisite/ Co-requisite
	Lecture	Lab		
Instrumentation and Process Control	2	3	3	Electrical Instruments and Measurements, PLC
Technopreneurship	3	0	3	
Life and Works of Rizal	3	0	3	
Foreign Language	3	0	3	
Project Study 2	2	3	3	Project Study 1 W/ IPR
Industrial Organization and Management	3	0	3	
Purposive Communication	3	0	3	
Production Management	3	0	3	
Total	**22**	**6**	**24**	

FOURTH YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Student Internship Program 1	0	600	6	Completed Academic Requirements
Total			**6**	

FOURTH YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Student Internship Program 2	0	600	6	Student Internship Program 1
Total			**6**	

B.3 MINIMUM PROGRAM OUTCOMES AND SAMPLE CURRICULUM MAP for the BIndTech -ELT

Program Outcomes

Graduates of the BIndTech -ELT program must have the following:

a. Ability to analyze broadly defined industrial technology processes by using analytical tools that enhances creativity, innovativeness, and intellectual curiosity to improve methods, processes, and systems that meet the industry standards

b. Ability to design and implement broadly defined industrial systems, components, products or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards

c. Ability to apply appropriate techniques, resources, and state-of-the-art industrial technology tools to meet current industry needs and use these modern tools and processes to improve and increase entrepreneurial activities upholding the safety and health standards of business and industry

d. Ability to communicate with diverse groups of clienteles the appropriate cultural language with clarity and persuasion, in both oral and written forms, including understanding and giving of clear instructions, high comprehension level, effectiveness in delivering presentations and writing documents, and articulating technological innovation outputs

e. Ability to develop leadership and management skills in a team-based environment by making informed decisions, keeping the team motivated, acting and delegating responsibility, and inspiring positive changes in the organization by exercising responsibility with integrity and accountability in the practice of one's profession

f. Practice the moral responsibilities of an industrial technologist to manage and balance wider public interest and uphold the norms and safety standards of the industrial technology profession

g. Ability to demonstrate enthusiasm and passion for continuous personal and professional development in broadly defined industrial technology and effecting positive changes in the entrepreneurial and industrial endeavor

h. Recognition of the need for, and an ability to engage lifelong learning

Legend:

Code	*Descriptor*	*Definition*
I	Introductory	A course that provides a foundational understanding of the outcome
E	Enabling	A course that strengthens the outcome
D	Demonstrating	A course that exhiBIndTechs or shows the outcome

TECHNICAL COURSES

a. Math and Science Courses

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Comprehensive Math	I							
Chemistry for Industrial Technologist	I	I						
Physics for Industrial Technologist	I	I						

b. Applied Courses

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Introduction to Information Technology	I	I						
Computer Programming	I	I						
Industrial Drawing		I		I				
Materials Technology Management			I			I		
Quality Control and Assurance			I			I		
Industrial Organization and Management				I	I			
Industrial Psychology				I		I		
Technopreneurship				I			E	
Production Management			I		I			
Foreign Language				I				

c. Professional Courses

Course	Relationship to Student Outcomes							
	a	b	c	d	e	f	g	h
Occupational Safety and Health			I	I		E		E
Electricity and Electronics Principles	I		E	E		D`		

DC Circuits	I	E	E			E		
Shop Processes, Tools and Equipment	E	E	D	D		E		
AC Circuits	E	D	D					
Philippine Electrical Code	E	E	E					
Electrical Instruments And Measurements	D	D	D	D				
Residential Wiring Systems	D	D	D	D		D		
Industrial Motor Controllers	D	D	D	D		D		
Electrical Machines	D	D	D	D				
Logic Circuits	D	D	D					
Power Production And Management Systems	D	D	D				D	D
Industrial Wiring Systems	D	D	D	D		D		
Transmission and Distribution Systems	D	D	D	D		D		
Programmable Logic Controllers	D	D	D					
Electrical Computer Aided Design	E	D	D					
Instrumentation and Process Control	D	D	D					D
Electro-Pneumatic Systems	D	D	D					
Project Study 1 with IPR		D		D	D	D	D	
Project Study 2		D		D	D	D	D	
Student Internship Program 1				E	E	E	E	
Student Internship Program 2				D	D	D	D	

NON-TECHNICAL COURSES

d. Required General Education

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Understanding the Self								E
Readings in the Philippine History		I						
The Contemporary World		E						
Mathematics in the Modern World	I							
Purposive Communication				E				
Art Appreciation				E				
Science, Technology and Society		E						
Ethics						E		

e. General Education Electives

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Elective 1							I	
Elective 2							I	
Elective 3							I	

f. Mandated Course

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Life and Works of Rizal				E				

g. Physical Education

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
PATHFIT 1								E
PATHFIT 2								E
PATHFIT 3								E
PATHFIT 4								E

h. National Service Training Program

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
NSTP 1								E
NSTP 2								E

B.4 SAMPLE COURSE SPECIFICATIONS for the BIndTech -ELT

TECHNICAL COURSES

a. Mathematics and Science Courses

Course Name	**COMPREHENSIVE MATH**
Course Description	This course covers discussion on circle and conic sections and includes graphing conic sections. It also includes discussion on systems of non-linear equations, sequences and series, arithmetic sequences and series, geometric sequences and series, principle of mathematical induction and binomial theorem. It also covers discussion on the unit circle, circular functions, trigonometric identities, inverse trigonometric functions and polar coordinate system.
Number of Units for Lecture and Laboratory	5 units lecture
Number of Contact Hours per Week	5 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Conic sections - Circle - Ellipse - Parabola - Hyperbola - Degenerate cases • Systems of Nonlinear Equations - Series - Sequence • Mathematical induction • Binomial theorem • Circular function • Trigonometric identities • Inverse trigonometric functions • Polar coordinate system

Course Name	**CHEMISTRY FOR INDUSTRIAL TECHNOLOGIST**
Course Description	The course introduces the students to general concepts of chemistry through classroom and laboratory experience. It emphasizes the chemical bonds, compound formations, chemical reactions and symbolic representations, the mole concept and its applications, gas laws, solutions and colloids, acids, bases and salts, and chemical equilibrium. The laboratory part includes activities and experiments aimed to strengthen chemical principles and concepts learned in the lecture part and develop student's skills in the use of common laboratory apparatus. This also includes discussions on proper use of common laboratory apparatus, first aid in the laboratory, systematic

	presentation of laboratory data and application of the scientific method.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Matter and its properties • Measurements • Atoms, Molecules and Ions • Stoichiometry • Gases • Electronic Structure of an Atom • Electronic Structure of an Atom and Periodicity • Chemical Bond/ Ionic Bond • Covalent Bond • Organic Compound • Intermolecular Forces /Liquids and Solids • Physical Properties of solution • Thermochemistry • Chemical Kinematics • Chemical Thermodynamics • Chemical Equilibrium • Acids, Bases Equilibria and Salt Equilibrium
Laboratory Equipment	See Annex IV

Course Name	**PHYSICS FOR INDUSTRIAL TECHNOLOGIST**
Course Description	This is an undergraduate level course in Physics for the Non-STEM courses that covers Mechanics, Waves, Thermodynamics, Electricity, Magnetism, Optics, and Modern Physics. The course gives focus on the conceptual and theoretical aspect of these topics and its applications in real-world problems.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Comprehensive Math
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Units, Physical Quantities and Vectors • Motion • Newton's Laws of Motion and Applications • Work, Energy and Energy Conservation • Momentum, Impulse and Collisions

	• Rotational Motion • Fluid Mechanics • Periodic Motion, Mechanical Waves and Sound • Temperature and Heat • Ideal Gases and The Laws of Thermodynamics • Electric Charge, Electric Fields and Gauss' Law • Electric Potential, Capacitance and Dielectrics • Current, Resistance and Electromotive Force • Direct Current Circuits • Magnetism • Light and Geometric Optics • Relativity
Laboratory Equipment	See Annex IV

b. Applied Courses

Course Name	**INTRODUCTION TO INFORMATION TECHNOLOGY**
Course Description	This course is designed to teach the fundamentals of computer hardware and software, the Internet and the Web, and concepts such as security, networking, and the responsibilities of an IT professional.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Information Technology, the Internet, and You • The System Unit • Input and Output • Secondary Storage • System Software • The Internet, the Web, and Electronic Commerce • Basic Application Software • Specialized Application Software • Communications and Networks • Privacy, Security, and Ethics
Laboratory Equipment	See Annex IV

Course Name	**COMPUTER PROGRAMMING**
Course Description	The course provides the student with sound background in the principles of fundamentals in procedural programming. The course helps the student to develop analytical thinking through understanding logic formulation using the techniques in flowcharting. It encompasses a structured programming language, its environment and control structures. The course aids the student in solving simple to complex

	problems by developing programs using a structured programming language.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Introduction to Information Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Program Logic Formulation – Concepts and Decision • PLF – Loops and Trailers • PLF – Arrays • Understanding Structured Programming and its Environment • Selection Constructs – If-Else / Nested Ifs, Switch • Looping Constructs – For, While, Do-While Loop • Arrays – Single and Multi- Dimension • Functions • Recursion • Pointers
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL DRAWING**
Course Description	This course deals in acquiring fundamental skills in conventional technical drawing its analogy in computer-aided drawing following the standards system of measurements and annotations to produce projection drawings to include approximate representation (isometric) of an object and rendering.
Number of Units for Lecture and Laboratory	1 units lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Conventional Technical Drawing - Conventional Technical Drawing Introduction - Pictorial Drawings with Annotations and Rendering - Working Drawing Management Production • Computer-Aided Drawing - AutoCAD Introduction, Interface Exploration and System Customization - AutoCAD Orthographic Drawing - 2D (Isometric) and 3D Modeling - CAD Drawing Management and Production
Laboratory Equipment	See Annex IV

Course Name	**MATERIALS TECHNOLOGY MANAGEMENT**
Course Description	This course provides a realistic insight on how individual become effective and productive manager. It also deals with the theories, principles and practices in production and processing materials. It includes the study of materials, industry and other engineering materials used for production of manmade items and machine components. It analyzes the different processes involved in the production of parts and components of mechanism. The course also covers safety production and precautions relative to the material process/ or material handling.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Material technology management • Technology and Innovation • Establishment of Technology • Strategizing • Profiting Innovation • Protecting Innovation • Humanizing Innovation • Product development Process • Materials Technology Process • Innovation Failure - Fracture - Fatigue - Corrosion - Wear • Environment

Course Name	**QUALITY CONTROL AND ASSURANCE**
Course Description	The course is designed to provide a fundamental, yet comprehensive coverage of quality control concepts, which lead towards sound understanding of the basic principles of quality control. It presents, in general term, the modern field of quality control as a body of managerial, technological, behavioral and economic knowledge, together with organized application of the knowledge to practical improvements of industrial operations.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program

Course Outcomes	To be identified by the program
Course Outline	• Introduction to Quality Control and the Total Quality System • Evolution of Quality Control • Quality • Quality Control • Quality Assurance • Quality Circles • Benefits of Quality Control • Quality and Reliability • Quality Improvement • Quality Costs • Control Charts for Variables and Attributes • Graphical Methods of Data Presentation and Quality Improvement • Deming's Philosophy of Quality • Taguchi Methods in Design and Quality Improvement

Course Name	**INDUSTRIAL ORGANIZATION AND MANAGEMENT**
Course Description	This subject aims to develop student's understanding of basic concepts of the activities included in a manufacturing plant and his relationship to them in an industrial technology activity. Topics covered are methods of technology and motion of study, work measurement techniques, wage and salary plans, job evaluation and wage administration, control of production, control of quality and cost, including budgetary control.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to industries and manufacturing. • Industries management and planning - Organizational structure - Operational Analysis - Risk and forecasting • Financing and Budgeting • Research and Development • Physical Facilities • Production and workflow planning • Productivity Improvement • Quantity Control • Quality Control • Labor Management Relations • Job and Wages • Marketing • Challenges to Industrial organization and management - Environmental issues • Industry and community concerned.

Course Name	**INDUSTRIAL PSYCHOLOGY**
Course Description	This course is an application of the principles and theories of learning, emotion, psychological testing, motivation, and clinical measurements as applied to non-machine system and relationships.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Industrial Psychology • Fundamentals of Human Behavior • Organizational Behavior • Dealing with Individuals • Dealing with Groups • Organizational in the Organization

Course Name	**TECHNOPRENEURSHIP**
Course Description	Technopreneurship is a philosophy, a way of building a career or perspective in life. The course covers the value of professional and life skills in entrepreneurial thought, investment decisions, and action that students can utilize in starting technology companies or executing research and development projects in companies as they start their careers. The net result is a positive outlook towards wealth creation, high value adding, and wellness in society.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• Introduction
	  - Entrepreneurial Mindset
	  - Innovation and Ideas
	  - Products and Services
	  - Team Formation
	• Customer
	• Value Proposition
	• Market Identification and Analysis
	• Creative Competitive Advantage
	• Business Models
	• Introduction to Intellectual Property
	• Execution and Business Plan
	• Financial Analysis and Accounting Basics

	• Raising Capital • Ethics, Social Responsibility and Globalization

Course Name	**PRODUCTION MANAGEMENT**
Course Description	It is a three-unit course which primarily discusses the principles, concepts and basic problems affecting the manufacturing and non-manufacturing firms. It also includes the methods, strategies and application of various economical and mathematical tools in solving the production and operation related problems.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to POM • Competitiveness, strategy and productivity • Product and service design • Capacity planning • Process selection and facility layout • Designing of work system • Location planning and analysis • Inventory management • Project management

Course Name	**FOREIGN LANGUAGE**
Course Description	This course enables the learners to have a functional grasp of grammar of a foreign language for communicative purposes. It also exposes the learners with the history, literature and culture of this language. The learners will be equipped with the different language skills and vocabulary needed to translate and interpret various types of communications.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Use of foreign language in formal and informal communicative situations • Interpretation of information conveyed in oral and written communicative contexts

	• Application of language skills in translation, academe, business and technical support. • Communicative strategies appropriate in formal and informal situations • Language skills in various socio-cultural settings

c. Professional Courses

Course Name	**OCCUPATIONAL SAFETY AND HEALTH**
Course Description	The course introduces the students to the basic occupational safety and health. The students will learn safe work practices and principles in industries and to identify and prevent illnesses, accidents and injuries associated in the work. The course will also cover the Philippine governing laws on OSH and tackles key concepts, principles and practices that are foundational knowledge requirements applicable in almost all industries. It also focuses on the identification of components of effective OSH programs and demonstration of some skills in identifying hazards and corresponding control measures at the workplace.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• The Basic Occupational Safety and Health (BOSH) Framework • OSH Situationer • Unsafe Acts and Conditions • Housekeeping • Fire Safety • Electrical Safety • Machine Safety • Materials Handling and Storage • Personal Protective Equipment (PPE) • Accident Investigation • Industrial Hygiene and Control Measure • Safety and Health Inspection • OSH Administration and Programming

Course Name	**ELECTRICITY AND ELECTRONICS PRINCIPLES**
Course Description	This course deals with the basics electrical and electronics components and their characteristics, basic electronic circuit, control application including the study of physical, chemical and electrical properties of conductors, semi-conductors and insulators.
Number of Units for Lecture and Laboratory	1 unit lecture; 1 unit laboratory

Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Basic Electricity • Conductors and Insulators • Semi-conductors • Transformers • Basic electronics • Capacitors • Inductors
Laboratory Equipment	See Annex IV

Course Name	**DC CIRCUITS**
Course Description	This course deals with electric and magnetic fields, that includes fundamentals of electrical and electronics laws, series and parallel circuits, including circuit theories and related problem-solving activities, maximum power transfer and etc.
Number of Units for Lecture and Laboratory	1 unit lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• The language of electric and electronics • Power of tens and scientific notations, unit prefixes and resistor color codes • Ohms law • Current and voltage • Resistance and power • Series resistive circuit • Parallel and series parallel resistive circuit
Laboratory Equipment	See Annex IV

Course Name	**SHOP PROCESSES, TOOLS, AND EQUIPMENT**
Course Description	This course deals with fundamentals of welding, sheet metal works, bench work, refrigeration and air-conditioning and wood working, including the study of tools and equipment.
Number of Units for Lecture and Laboratory	1 unit lecture; 1 unit laboratory

Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Practical Electricity • Housekeeping • Electrical tools, equipment, materials and supplies • Bench work • Welding (SMAW) • Refrigeration and Air conditioning • Woodworking
Laboratory Equipment	See Annex IV

Course Name	**AC CIRCUITS**
Course Description	This course deals with the single-phase AC circuits, equation of voltage, current, power, resistance, inductance, capacitance, and impedance in series and parallel circuits. This includes complex quantities and vectors and other problem-solving activities.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electricity/Electronics Principles, DC Circuits
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Alternating current fundamentals • Resistance in AC circuits • Measurement of energy • Average current and voltage • Inductance in AC • Capacitors and capacitive reactance in AC • RC, RL and time constant • Resistance and impedance in series circuit • Capacitors in AC circuit • Resistance, inductive reactance, and capacitive reactance in series circuit • AC parallel circuits
Laboratory Equipment	See Annex IV

Course Name	**PHILIPPINE ELECTRICAL CODE**
Course Description	This course deals with the probation required by the Philippines electrical code, latest edition. This ensures the safety of the electrical practitioner and protect the property from hazard arising from the use of electricity.
Number of Units for Lecture and Laboratory	2 units lecture
Number of Contact Hours per Week	2 hours lecture
Prerequisites	OSH, Electrical/Electronic Principles, DC Circuit
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Republic Act 7920 • Wiring and Protection • Wiring Methods and Materials • Equipment for General • Special Occupancies • Special Equipment • Special Conditions • Communication System • Distribution System Protection • Requirements for Watercraft Carrying Flammable Liquid and Gases • Navigation Communication and Alarm System

Course Name	**ELECTRICAL INSTRUMENTS AND MEASUREMENTS**
Course Description	This course deals with accuracy of measurements and error analysis. Absolute and secondary instruments and indicating instruments. Moving coil and moving iron instruments. Dynamometer type instruments, induction type instruments. Watt meter of measuring of power and power factor. Bridges (DC). Bridges (AC). Current and potential transformers and oscilloscopes and their uses.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit Laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	DC circuit, Shop Processes, Tools and Equipment
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Review on the Fundamental Operating Principles of DC motors • Electrodynamometer Instruments • Iron Vane Instruments • High Voltage Voltmeter and High Current Ammeter • Introduction to Basic Transistorized Electrical Instruments
Laboratory Equipment	See Annex IV

Course Name	**RESIDENTIAL WIRING SYSTEMS**
Course Description	This course introduces the principle of electrical wiring systems its applications, installation troubleshooting and repair. Student will develop practical skills in design; testing and problem solving related to electronic communication circuits in practical activities and design requirements in an electrical installation.
Number of Units for Lecture and Laboratory	1 unit lecture; 2 units laboratory
Number of Contact Hours per Week	1 hour lecture; 6 hours laboratory
Prerequisites	AC circuit, PEC, Electrical Instruments and Measurements
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Types of Residential wiring • Methods of wiring installation • Types of wiring materials • Tools and equipment • Identification of Measuring instruments • Troubleshooting, Repair and Maintenances • Safety precautions in the workplace
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL MOTOR CONTROLLERS**
Course Description	This course covers the industrial electromagnetic controls and operations as applied in industrial machineries and processes. It includes the study of principle of operation of electrical control components.
Number of Units for Lecture and Laboratory	1 unit lecture; 2 units laboratory
Number of Contact Hours per Week	1 hour lecture; 6 hours laboratory
Prerequisites	AC circuits, PEC, Electrical Instrument and Measurements
Co-requisites	Electrical Machines
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Electrical Components and Symbols • Full Voltage Motor Starter • Three Phase Full Voltage Motor • Reduced Voltage Starter • plugging and braking • Speed Control of AC Motors • Electronics Control Fundamentals
Laboratory Equipment	See Annex IV

Course Name	**ELECTRICAL MACHINES**
Course Description	This course deals on two categories of electrical machines commonly used in industry. The Dc machines cover the principles, construction, characteristics, repair and maintenance of the different types of Dc motors and generators. For Ac machines covers the principles of operation construction, characteristics, repair and maintenance of single phase and poly-phase motors and alternators. This includes the study of power transformer.
Number of Units for Lecture and Laboratory	1 lecture; 2 units laboratory
Number of Contact Hours per Week	1 hour lecture; 6 hours laboratory
Prerequisites	AC circuit, PEC, Electrical Instruments and Measurements
Co-requisites	Industrial Motor Controller
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• DC Generator constructions, operations, characteristics and application • DC Motor Construction, operation, characteristics and application • AC Motors Construction, Operation, Characteristics and Application • Alternator construction, operation, characteristics, and application • Transformers Installation and Connection
Laboratory Equipment	See Annex IV

Course Name	**LOGIC CIRCUITS**
Course Description	This course introduces foundation in digital design. Includes number systems and codes, basic logic gates, device parameters, Boolean algebra, logic circuit simplification techniques, timing analysis, application of combinational logic devices, programmable logic devices, flip-flops, registers, and/or counters.
Number of Units for Lecture and Laboratory	1 unit lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	Electricity/ electronics principles Industrial Motor controller
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Binary numbers • Numerical systems and codes • Boolean algebra • Logic functions and logic gates • Function simplification • Combinational logic modules and circuits • Information storage, flip-flops, registers • Introduction to digital circuit design tools

	• Implementation methodologies
Laboratory Equipment	See Annex IV

Course Name	**POWER PRODUCTION AND MANAGEMENT SYSTEMS**
Course Description	This course, the students will learn advance concepts on the operation, control, design, regulation and management of the power systems and networks. Critically evaluate methodologies, analytical procedures and research methods in energy power system and management.
Number of Units for Lecture and Laboratory	1 unit lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	Electrical machines, Industrial motor controllers
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Types of generating system • Generator set control and monitoring • Load dependent start/stop • Block-out restart • Load sharing • Start blocking of heavy consumers • Load shedding
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL WIRING SYSTEMS**
Course Description	This course deals with the study of commercial and industrial wiring systems, including wiring methods, circuit elements, PEC provisions and other regulatory standards involving design, planning and installation.
Number of Units for Lecture and Laboratory	1 unit lecture; 2 units laboratory
Number of Contact Hours per Week	1 hour lecture; 6 hours laboratory
Prerequisites	Residential Wiring Systems, industrial motor controllers, electrical machines
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Basic Electrical Practices • Wiring Methods • Raceway wiring • Wiring Design and Protection • System Grounding

Laboratory Equipment	See Annex IV

Course Name	**TRANSMISSION AND DISTRIBUTION SYSTEMS**
Course Description	This course is an overview of the standard for Power distribution and transmission systems. This covers the safety hazards involved with the operation and maintenance of electric power operation, transmission equipment, distribution lines, and equipment.
Number of Units for Lecture and Laboratory	2 unit lecture; 1 units laboratory
Number of Contact Hours per Week	2 hour lecture; 3 hours laboratory
Prerequisites	Power Production and Management System, Industrial Wiring System
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Transmission and Distribution System • Distribution • Systems • Transmission Line Parameters • Modeling and Performance of Transmission Lines • Insulators and Cables • Mechanical Design of Lines and Grounding
Laboratory Equipment	See Annex IV

Course Name	**PROGRAMMABLE LOGIC CONTROLLERS**
Course Description	This course deals to the individual stability to understand, interpret, analyze and read electrical ladder drawing acquaints students with basic electromechanical components commonly used in electrical control circuit as well as solid state relays and the role of programmable controllers.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Logic Circuits
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• PLC's Overview • PLC Hardware Components • Number system codes • Fundamentals of Logic • Basic of plc programming • PLC wiring and ladder logic diagram • Programming timers • Data manipulation instruction

	• Programming counters • Program control instructions • Troubleshooting techniques
Laboratory Equipment	See Annex IV

Course Name	**ELECTRICAL COMPUTER AIDED DESIGN**
Course Description	This course student acquires basic drafting knowledge and skills for the electrical design. It deals free hand lettering used of instrument, applied geometry, technical sketching, multi-view projection, basic dimension and selected Autocad commands.
Number of Units for Lecture and Laboratory	1 units lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hours lecture; 3 hours laboratory
Prerequisites	Industrial Drawing, introduction to Information Technology, Philippine Electrical Code
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Basic workflow • Project basics • Schematic wiring • Schematic components • Panel layouts • Setting and configuration • Custom components • Custom data • PLC modules
Laboratory Equipment	See Annex IV

Course Name	**INSTRUMENTATION AND PROCESS CONTROL**
Course Description	This course covers the fundamentals of instrumentation. It deals with the principles of instrumentation and control devices including its operation, design, function and installation requirements. It's also covers the fundamentals of measuring common process variables including pressure, level, flow, and temperature.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electrical Instruments and Measurements, industrial motor controllers, Industrial Wiring Systems
Co-requisites	NONE
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• The Importance of Process Control • Control Loop Equipment and Technology • Control Loop Equipment and Technology • Process Control Loop
Laboratory Equipment	See Annex IV

Course Name	**ELECTRO-PNEUMATIC SYSTEMS**
Course Description	This course deals with the study of the operation, design and function of various pneumatic and electro-pneumatic elements commonly used in industry. This includes the study of different pneumatic and electro-pneumatic symbols and its application in accordance with ANSI, DIN, ISO standards.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Programmable Logic Controllers
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to pneumatics Introduction to electro-pneumatics • Direct and indirect control in electro-pneumatics • Logic operations in electro-pneumatics • limit switches • proximity switches and pressure switches • Interfacing the simulation with the real world
Laboratory Equipment	See Annex IV

Course Name	**PROJECT STUDY 1 WITH INTELLECTUAL PROPERTY RIGHTS**
Course Description	This course deals with the conceptualization of a project proposal based on the line of work/specialization of the student. It includes the study of research methodology as employed in applied research and the process of preparing a project report. The course also covers discussion of the different intellectual property rights such as patent, utility model, industrial design, copyright, trademark and trade secret. It also includes the governing intellectual property laws and an in-depth analysis of cases on IP violations and infringements as well as patent search and information strategies using various IP databases and the entire IP prosecution process.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program

Course Outcomes	To be identified by the program
Course Outline	• Introduction to Research • Intellectual Property Awareness and Orientation • Patent Search and Information Strategies • Introduction to Research: Research Problem and Objectives • Introduction to Research: Selecting the Best Solution • Conceptualizing Research Project Proposal • Project Proposal Writing • Research Ethics and Plagiarism • Proposal Oral Defense
Laboratory Equipment	Computer and any programming language and/or simulation software tool; materials, components and tools needed for prototype development and testing

Course Name	**PROJECT STUDY 2**
Course Description	The course deals with the project application wherein previous or new design shall be placed into actual prototypes, functional and operational in form and will be course for inspection and evaluation applying the requirements of good design and the criteria for design evaluation.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Project Study 1 with IPR
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Project Development • Revisions of Project Proposal • Prototype Development • Documentation • Test and Evaluation • Final Oral Defense • Submission of final document
Laboratory Equipment	Computer and any programming language and/or simulation software tool; materials, components and tools needed for prototype development and testing

Course Name	**STUDENT INTERNSHIP PROGRAM 1**
Course Description	This course aims to develop industrial competencies of the students through direct exposure to actual work, strengthening the skills acquired from school. Students shall develop and implement desirable work haBIndTech and attitude required of an effective and productive labor force.
Number of Units for Lecture and Laboratory	6 units

Minimum Number of Hours Required for Industry Training	600 hours per semester
Prerequisites	Completed Academic Requirements
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Presentation of Policies and Guidelines • Multidisciplinary Team Approaches • Assertions of Student's OJT in the company • Submission of Progress Reports • Completion of 600 hours • Submission of Final Report

Course Name	**STUDENT INTERNSHIP PROGRAM 2**
Course Description	This course exposes the students to the actual workplace applying the basic and advanced skills. The students will be made to work in the industry with added exposure to management and supervisory work situation.
Number of Units for Lecture and Laboratory	6 units
Minimum Number of Hours Required for Industry Training	600 hours per semester
Prerequisites	Student Internship Program 1
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Presentation of Policies and Guidelines • Multidisciplinary Team Approaches • Assertions of Student's OJT in the company • Submission of Progress Reports • Completion of 600 hours • Submission of Final Report • Final Oral Presentation

C. BACHELOR OF INDUSTRAL TECHNOLOGY with major in Electronics Technology (BIndTech -ELX)

C.1 CURRICULUM COMPONENT for the BIndTech -ELX

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/ Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
I. TECHNICAL COURSES			
A. Math and Science Courses			
Comprehensive Mathematics	5	0	5
Chemistry for Industrial Technologist	2	3	3
Physics for Industrial Technologist	2	3	3
Sub-total	**9**	**6**	**11**
B. Applied Courses			
Introduction to Information Technology	2	3	3
Computer Programming	2	3	3
Industrial Drawing	1	3	2
Materials Technology Management	3	0	3
Quality Control and Assurance	3	0	3
Industrial Organization and Management	3	0	3
Industrial Psychology	3	0	3
Technopreneurship	3	0	3
Production Management	3	0	3
Foreign Language	3	0	3
Sub-total	**26**	**9**	**29**
C. Professional Courses			
Occupational Safety and Health	3	0	3
Electronic Devices 1	3	6	5

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
Electronic Devices 2	2	3	3
Electronic Communications 1	2	3	3
Electronics CAD	1	3	2
Electronic Communications 2	2	3	3
Digital Electronics	2	3	3
Instrumentation and Process Control	2	3	3
Sensor Technology	2	3	3
Multimedia Systems	2	3	3
Industrial Electronics	2	3	3
Electro-Pneumatic System	2	3	3
Programmable Controllers	2	3	3
Industrial Robotics	2	3	3
Electronic Laws and Standards	3	0	3
Project Study 1 with Intellectual Property Rights	2	3	3
Project Study 2	2	3	3
Student Internship Program 1	0	600	6
Student Internship Program 2	0	600	6
Sub-total	**38**	**1248**	**64**
Total Technical Courses	**73**	**1263**	**104**
II. NON-TECHNICAL COURSES			
D. Required General Education			
Understanding the Self	3	0	3
Readings in the Philippine History	3	0	3
The Contemporary World	3	0	3

Classification / Field / Course	Minimum No. of Hours Lecture/Laboratory/ Tutorial/Field Work/ Drafting		Minimum Credit Units
	Lecture	L/T/FW/D	
Mathematics in the Modern World	3	0	3
Purposive Communication	3	0	3
Art Appreciation	3	0	3
Science, Technology and Society	3	0	3
Ethics	3	0	3
Sub-total	**24**	**0**	**24**
E. General Education Electives			
GE Elective 1	3	0	3
GE Elective 2	3	0	3
GE Elective 3	3	0	3
Sub-total	**9**	**0**	**9**
F. Mandated Course			
Life and Works of Rizal	3	0	3
Sub-total	**3**	**0**	**3**
G. Physical Education			
PATHFIT 1	2	0	2
PATHFIT 2	2	0	2
PATHFIT 3	2	0	2
PATHFIT 4	2	0	2
Sub-total	**8**	**0**	**8**
NSTP 1	3	0	3
NSTP 2	3	0	3
Sub-total	**6**	**0**	**6**
Total Non-Technical Courses	**50**	**0**	**50**
GRAND TOTAL	**123**	**1263**	**154**

SUMMARY

BACHELOR OF INDUSTRIAL TECHNOLOGY
with major in Electronics Technology

Classification / Field	Total No. of Hours		Total No. of Units
	Lecture	L/T/FW/D	
I. TECHNICAL COURSES			
A. Mathematics and Science Courses	9	6	11
B. Applied Courses	26	9	29
C. Professional Courses	38	1248	64
Sub-Total	**73**	**1263**	**104**
II. NON-TECHNICAL COURSES			
D. Required General Education Courses	24	0	24
E. General Education Electives	9	0	9
F. Mandated Course	3	0	3
G. Physical Education	8	0	8
H. National Service Training Program	6	0	6
Sub-Total	**50**	**0**	**50**
GRAND TOTAL	**123**	**1263**	**154**

C.2 SAMPLE PROGRAM OF STUDY for the BIndTech -ELX

FIRST YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Occupational Health and Safety	3	0	3	None
Electronic Devices 1	3	6	5	None
Electronic Communications 1	2	3	3	None
Electronics CAD	1	3	2	None
Industrial Drawing	1	3	2	None
Mathematics in the Modern World	3	0	3	None
PATHFIT 1	2	0	2	None
NSTP 1	3	0	3	None
Total	**15**	**15**	**23**	

FIRST YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Electronic Devices 2	2	3	3	Electronic Devices 1
Electronic Communications 2	2	3	3	Electronic Communications 1
Digital Electronics	2	3	3	
Comprehensive Mathematics	5	0	5	
Chemistry for Industrial Technologists	2	3	3	
Introduction to Information Technology	2	3	3	
PATHFIT 2	2	0	2	PATHFIT 1
NSTP 2	3	0	3	NSTP 1
Total	**17**	**15**	**22**	

SECOND YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Instrumentation and Process Control	2	3	3	
Sensor Technology	2	3	3	
Electronic Laws and Standards	3	0	3	
Computer Programming	2	3	3	
Physics for Industrial Technologists	2	3	3	
GE Elective 1	3	0	3	
Ethics	3	0	3	
PATH FIT 3	2	0	2	PATH FIT 2
Total	**19**	**12**	**23**	

SECOND YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Multimedia Systems	2	3	3	
Industrial Electronics	2	3	3	
Electro-Pneumatic Systems	2	3	3	
Art Appreciation	3	0	3	
The Contemporary World	3	0	3	
Materials Technology Management	3	0	3	
Quality Control and Assurance	3	0	3	
PATH FIT 4	2	0	2	PATH FIT 3
Total	**20**	**9**	**23**	

THIRD YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Programmable Controllers	2	3	3	Industrial Electronics
Project Study 1 with Intellectual Property Rights	2	3	3	
Industrial Organization and Management	3	0	3	
Industrial Psychology	3	0	3	
GE Elective 2	3	0	3	
Understanding the Self	3	0	3	
Readings in Philippine History	3	0	3	
Science Technology and Society	3	0	3	
Total	**22**	**6**	**24**	

THIRD YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Industrial Robotics	2	3	3	Industrial Electronics
Project Study 2	2	3	3	Project Study 1 w/ IPR
Technopreneurship	3	0	3	
Production Management	3	0	3	
Foreign Language	3	0	3	
GE Elective 3	3	0	3	
Purposive Communication	3	0	3	
Life and Works of Rizal	3	0	3	
Total	**22**	**6**	**24**	

FOURTH YEAR – First Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Student Internship Program 1	0	600	6	Completed Academic Requirements
Total			**6**	

FOURTH YEAR – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ Co-requisite
	Lecture	Lab		
Student Internship Program 2	0	600	6	SIP 1
Total			**6**	

C.3 MINIMUM PROGRAM OUTCOMES AND SAMPLE CURRICULUM MAP for the BIndTech -ELX

Program Outcomes

Graduates of the BIndTech -ELX program must have the following:

a. Ability to analyze broadly defined industrial technology processes by using analytical tools that enhances creativity, innovativeness, and intellectual curiosity to improve methods, processes, and systems that meet the industry standards

b. Ability to design and implement broadly defined industrial systems, components, products or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards

c. Ability to apply appropriate techniques, resources and state-of-the-art industrial technology tools to meet current industry needs and use these modern tools and processes to improve and increase entrepreneurial activities upholding the safety and health standards of business and industry

d. Ability to communicate with diverse groups of clienteles the appropriate cultural language with clarity and persuasion, in both oral and written forms, including understanding and giving of clear instructions, high comprehension level, effectiveness in delivering presentations and writing documents, and articulating technological innovation outputs

e. Ability to develop leadership and management skills in a team-based environment by making informed decisions, keeping team motivated, acting and delegating responsibility and inspiring positive changes in the organization by exercising responsibility with integrity and accountability in the practice of one's profession

f. Ability to practice moral responsibilities of an industrial technologist to manage and balance wider public interest and uphold the norms and safety standards of the industrial technology profession

g. Ability to demonstrate enthusiasm and passion for continuous personal and professional development in broadly defined industrial technology and effecting positive changes in entrepreneurial and industrial endeavor

h. Ability to recognize the need for, and an ability to engage in life-long learning

Legend:

Code	*Descriptor*	*Definition*
I	Introductory	A course that provides foundational understanding of the outcome
E	Enabling	A course that strengthens the outcome
D	Demonstrating	A course that exhiBIndTechs or shows the outcome

TECHNICAL COURSES

a. Math and Science Courses

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Comprehensive Math	I							
Chemistry for Industrial Technologist	I	I						
Physics for Industrial Technologist	I	I						

b. Applied Courses

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Introduction to Information Technology	I	I						
Computer Programming	I	I						
Industrial Drawing		I		I				
Materials Technology Management			I			I		
Quality Control and Assurance			I			I		
Industrial Organization and Management Practices				I	I			
Industrial Psychology				I		I		
Technopreneurship				I			E	
Production Management			I		I			
Foreign Language				I				

c. Professional Courses

Course	*Relationship to Student Outcomes*							
	A	b	c	d	e	f	g	h
Occupational Safety and Health			I	I		E		E
Electronic Devices 1	I	E			D			
Electronic Devices 2	I	E			D			
Electronic Communications 1	E	D	D	D				
Electronics CAD	E	D	D					
Electronic Communications 2	E	D	D	D				
Digital Electronics	D	D	D					
Instrumentation and Process Control	D	D	D		D			
Sensor Technology	D	D	D		D			
Multimedia Systems	D	D	D	D				E
Industrial Electronics	D	D	D					

Electro-Pneumatics Systems	D	D	D					
Programmable Controllers	D	D	D					
Industrial Robotics	D	D	D					
Electronic Laws and Standards		E	E			E		
Project Study 1 with Intellectual Property Rights		D		D	D	D	D	
Project Study 2		D		D	D	D	D	
Student Internship Program 1				E	E	E	E	
Student Internship Program 2				D	D	D	D	

NON-TECHNICAL COURSES

d. Required General Education

Course	***Relationship to Student Outcomes***							
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**
Understanding the Self								E
Readings in the Philippine History		I						
The Contemporary World		E						
Mathematics in the Modern World	I							
Purposive Communication				E				
Art Appreciation				E				
Science, Technology and Society		E						
Ethics						E		

e. General Education Electives

Course	***Relationship to Student Outcomes***							
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**
Elective 1							I	
Elective 2							I	
Elective 3							I	

f. Mandated Course

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
Life and Works of Rizal				E				

g. Physical Education

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
PATHFIT 1								E
PATHFIT 2								E
PATHFIT 3								E
PATHFIT 4								E

h. National Service Training Program

Course	*Relationship to Student Outcomes*							
	a	b	c	d	e	f	g	h
NSTP 1								E
NSTP 2								E

C.4 SAMPLE COURSE SPECIFICATIONS for the BINDTECH -ELX

TECHNICAL COURSES

a. Mathematics and Science Courses

Course Name	**COMPREHENSIVE MATH**
Course Description	This course covers discussion on circle and conic sections and includes graphing conic sections. It also includes discussion on systems of non-linear equations, sequences and series, arithmetic sequences and series, geometric sequences and series, principle of mathematical induction and binomial theorem. It also covers discussion on the unit circle, circular functions, trigonometric identities, inverse trigonometric functions and polar coordinate system.
Number of Units for Lecture and Laboratory	5 units lecture
Number of Contact Hours per Week	5 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• Conic sections
	  - Circle
	  - Ellipse
	  - Parabola
	  - Hyperbola
	  - Degenerate cases
	• Systems of Nonlinear Equations
	  - Series
	  - Sequence
	• Mathematical induction
	• Binomial theorem
	• Circular function
	• Trigonometric identities
	• Inverse trigonometric functions
	• Polar coordinate system

Course Name	**CHEMISTRY FOR INDUSTRIAL TECHNOLOGIST**
Course Description	The course introduces the students to general concepts of chemistry through classroom and laboratory experience. It emphasizes the chemical bonds, compound formations, chemical reactions and symbolic representations, the mole concept and its applications, gas laws, solutions and colloids, acids, bases and salts, and chemical equilibrium. The laboratory part includes activities and experiments aimed to strengthen chemical principles and concepts learned in the

	lecture part and develop student's skills in the use of common laboratory apparatus. This also includes discussions on proper use of common laboratory apparatus, first aid in the laboratory, systematic presentation of laboratory data and application of the scientific method.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Matter and its properties • Measurements • Atoms, Molecules and Ions • Stoichiometry • Gases • Electronic Structure of an Atom • Electronic Structure of an Atom and Periodicity • Chemical Bond/ Ionic Bond • Covalent Bond • Organic Compound • Intermolecular Forces /Liquids and Solids • Physical Properties of solution • Thermochemistry • Chemical Kinematics • Chemical Thermodynamics • Chemical Equilibrium • Acids, Bases Equilibria and Salt Equilibrium
Laboratory Equipment	See Annex IV

Course Name	**PHYSICS FOR INDUSTRIAL TECHNOLOGIST**
Course Description	This is an undergraduate level course in Physics for the Non-STEM courses that covers Mechanics, Waves, Thermodynamics, Electricity, Magnetism, Optics, and Modern Physics. The course gives focus on the conceptual and theoretical aspect of these topics and its applications in real-world problems.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Comprehensive Math
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Units, Physical Quantities and Vectors • Motion

	• Newton's Laws of Motion and Applications • Work, Energy and Energy Conservation • Momentum, Impulse and Collisions • Rotational Motion • Fluid Mechanics • Periodic Motion, Mechanical Waves and Sound • Temperature and Heat • Ideal Gases and The Laws of Thermodynamics • Electric Charge, Electric Fields and Gauss' Law • Electric Potential, Capacitance and Dielectrics • Current, Resistance and Electromotive Force • Direct Current Circuits • Magnetism • Light and Geometric Optics • Relativity
Laboratory Equipment	See Annex IV

c. Applied Courses

Course Name	**INTRODUCTION TO INFORMATION TECHNOLOGY**
Course Description	This course is designed to teach the fundamentals of computer hardware and software, the Internet and the Web, and concepts such as security, networking, and the responsibilities of an IT professional.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Information Technology, the Internet, and You • The System Unit • Input and Output • Secondary Storage • System Software • The Internet, the Web, and Electronic Commerce • Basic Application Software • Specialized Application Software • Communications and Networks • Privacy, Security, and Ethics
Laboratory Equipment	See Annex IV

Course Name	**COMPUTER PROGRAMMING**
Course Description	The course provides the student with sound background in the principles of fundamentals in procedural programming. The course helps the student to develop analytical thinking through understanding logic formulation using the techniques in flowcharting. It encompasses a structured programming language, its environment and control

	structures. The course aids the student in solving simple to complex problems by developing programs using a structured programming language.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Introduction to Information Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Program Logic Formulation – Concepts and Decision • PLF – Loops and Trailers • PLF – Arrays • Understanding Structured Programming and its Environment • Selection Constructs – If-Else / Nested Ifs, Switch • Looping Constructs – For, While, Do-While Loop • Arrays – Single and Multi- Dimension • Functions • Recursion • Pointers
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL DRAWING**
Course Description	This course deals in acquiring fundamental skills in conventional technical drawing its analogy in computer-aided drawing following the standards system of measurements and annotations to produce projection drawings to include approximate representation (isometric) of an object and rendering.
Number of Units for Lecture and Laboratory	1 units lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Conventional Technical Drawing - Conventional Technical Drawing Introduction - Pictorial Drawings with Annotations and Rendering - Working Drawing Management Production • Computer-Aided Drawing - AutoCAD Introduction, Interface Exploration and System Customization - AutoCAD Orthographic Drawing - 2D (Isometric) and 3D Modeling - CAD Drawing Management and Production

Laboratory Equipment	See Annex IV

Course Name	**MATERIALS TECHNOLOGY MANAGEMENT**
Course Description	This course provides a realistic insight on how individual become effective and productive manager. It also deals with the theories, principles and practices in production and processing materials. It includes the study of materials, industry and other engineering materials used for production of manmade items and machine components. It analyzes the different processes involved in the production of parts and components of mechanism. The course also covers safety production and precautions relative to the material process/ or material handling.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Material technology management • Technology and Innovation • Establishment of Technology • Strategizing • Profiting Innovation • Protecting Innovation • Humanizing Innovation • Product development Process • Materials Technology Process • Innovation Failure - Fracture - Fatigue - Corrosion - Wear • Environment

Course Name	**QUALITY CONTROL AND ASSURANCE**
Course Description	The course is designed to provide a fundamental, yet comprehensive coverage of quality control concepts, which lead towards sound understanding of the basic principles of quality control. It presents, in general term, the modern field of quality control as a body of managerial, technological, behavioral and economic knowledge, together with organized application of the knowledge to practical improvements of industrial operations.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture

Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Quality Control and the Total Quality System • Evolution of Quality Control • Quality • Quality Control • Quality Assurance • Quality Circles • Benefits of Quality Control • Quality and Reliability • Quality Improvement • Quality Costs • Control Charts for Variables and Attributes • Graphical Methods of Data Presentation and Quality Improvement • Deming's Philosophy of Quality • Taguchi Methods in Design and Quality Improvement

Course Name	**INDUSTRIAL ORGANIZATION AND MANAGEMENT**
Course Description	This subject aims to develop student's understanding of basic concepts of the activities included in a manufacturing plant and his relationship to them in an industrial technology activity. Topics covered are methods of technology and motion of study, work measurement techniques, wage and salary plans, job evaluation and wage administration, control of production, control of quality and cost, including budgetary control.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to industries and manufacturing. • Industries management and planning - Organizational structure - Operational Analysis - Risk and forecasting • Financing and Budgeting • Research and Development • Physical Facilities • Production and workflow planning • Productivity Improvement • Quantity Control • Quality Control • Labor Management Relations • Job and Wages • Marketing

	• Challenges to Industrial organization and management - Environmental issues • Industry and community concerned.

Course Name	**INDUSTRIAL PSYCHOLOGY**
Course Description	This course is an application of the principles and theories of learning, emotion, psychological testing, motivation, and clinical measurements as applied to non-machine system and relationships.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Industrial Psychology • Fundamentals of Human Behavior • Organizational Behavior • Dealing with Individuals • Dealing with Groups • Organizational in the Organization

Course Name	**TECHNOPRENEURSHIP**
Course Description	Technopreneurship is a philosophy, a way of building a career or perspective in life. The course covers the value of professional and life skills in entrepreneurial thought, investment decisions, and action that students can utilize in starting technology companies or executing research and development projects in companies as they start their careers. The net result is a positive outlook towards wealth creation, high value adding, and wellness in society.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction - Entrepreneurial Mindset - Innovation and Ideas - Products and Services - Team Formation • Customer • Value Proposition

	• Market Identification and Analysis • Creative Competitive Advantage • Business Models • Introduction to Intellectual Property • Execution and Business Plan • Financial Analysis and Accounting Basics • Raising Capital • Ethics, Social Responsibility and Globalization

Course Name	**PRODUCTION MANAGEMENT**
Course Description	It is a three-unit course which primarily discusses the principles, concepts and basic problems affecting the manufacturing and non-manufacturing firms. It also includes the methods, strategies and application of various economical and mathematical tools in solving the production and operation related problems.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to POM • Competitiveness, strategy and productivity • Product and service design • Capacity planning • Process selection and facility layout • Designing of work system • Location planning and analysis • Inventory management • Project management
Course Name	**FOREIGN LANGUAGE**
Course Description	This course enables the learners to have a functional grasp of grammar of a foreign language for communicative purposes. It also exposes the learners with the history, literature and culture of this language. The learners will be equipped with the different language skills and vocabulary needed to translate and interpret various types of communications.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program

Course Outline	• Use of foreign language in formal and informal communicative situations • Interpretation of information conveyed in oral and written communicative contexts • Application of language skills in translation, academe, business and technical support. • Communicative strategies appropriate in formal and informal situations • Language skills in various socio-cultural settings

c. Professional Courses

Course Name	**OCCUPATIONAL SAFETY AND HEALTH**
Course Description	The course introduces the students to the basic occupational safety and health. The students will learn safe work practices and principles in industries and to identify and prevent illnesses, accidents and injuries associated in the work. The course will also cover the Philippine governing laws on OSH and tackles key concepts, principles and practices that are foundational knowledge requirements applicable in almost all industries. It also focuses on the identification of components of effective OSH programs and demonstration of some skills in identifying hazards and corresponding control measures at the workplace.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• The Basic Occupational Safety and Health (BOSH) Framework • OSH Situationer • Unsafe Acts and Conditions • Housekeeping • Fire Safety • Electrical Safety • Machine Safety • Materials Handling and Storage • Personal Protective Equipment (PPE) • Accident Investigation • Industrial Hygiene and Control Measure • Safety and Health Inspection • OSH Administration and Programming

Course Name	**ELECTRONIC DEVICES 1**
Course Description	This course includes an introduction to theories and applications of passive electronic devices involving electronic accessories, tools and instruments. It also covers the principles governing electrical

	quantities which include Ohm's Law and other fundamental basic electronic circuit analysis.
Number of Units for Lecture and Laboratory	3 units lecture; 2 units laboratory
Number of Contact Hours per Week	3 hours lecture; 6 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Current, Voltage and Resistance • Conductors and Insulators • Resistors • Capacitors • Inductors • Transformers • Hand tools • Multi-meters • PCB • Soldering • Network Laws and Theorems
Laboratory Equipment	See Annex IV

Course Name	**ELECTRONIC DEVICES 2**
Course Description	This course incudes the active semiconductor discrete devices and circuits, its operational characteristics and applications of diode, bipolar and field effect junction transistors. It further examines the amplifier circuits and its frequency response. Emphasis is on component testing, troubleshooting and application of laboratory test equipment.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronic Devices 1
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Diode • BJT's • Transistor Biasing • Small Signal Bipolar Amplifiers • Power Amplifiers • FET
Laboratory Equipment	See Annex IV

Course Name	**ELECTRONIC COMMUNICATIONS 1**
Course Description	This course will provide students with basic knowledge of electronic communication systems, models and techniques, transmitters, receivers and radio modulations. It will also provide students with practical knowledge of equipment and devices used in communication, including Radio-telecommunication systems.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronic Devices 1
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Bandwidth • Filters • Linear modulation • Angle modulation • Phase locked loop • Pulse modulation • Multiplexing techniques • Noise analysis • Radio transmitters and receivers
Laboratory Equipment	See Annex IV

Course Name	**ELECTRONICS CAD**
Course Description	This course provides students with the fundamental knowledge and facts of Electronic Design (ED), the fabrication phases, related infrastructure and the available tools of ED in the industries. The course will primarily focus on fundamentals of electronic design phases, design and fabrication of electronic prototype projects, planning and construction, testing and troubleshooting, industry standard practices, hands-on experience in project building, finalization for a mass-produced product and finally required documentation.
Number of Units for Lecture and Laboratory	1 unit lecture; 1 unit laboratory
Number of Contact Hours per Week	1 hour lecture; 3 hours laboratory
Prerequisites	Industrial Drawing
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Computer Aided Design • AutoCAD environment • Menu, Toolbars and Icons

	• CAD 2D Construction • Mirror, Polar Array, Rectangular Array Exercise, and Polygon Exercises • Printing and Plotting • 3D modelling • 3D assembly Drawing • The ECAD Environment • 2D and 3D Printing • Actual 3D project
Laboratory Equipment	See Annex IV

Course Name	**ELECTRONIC COMMUNICATIONS 2**
Course Description	This course provides an overview of data communications technology, terminology, hardware, software, modems, multiplexers, concentrators, switches, computer front-end processors and services. Students will learn to test, develop, maintain and troubleshoot electronic communication components, circuits and systems use in the communication industry.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronics Communication1
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Random variables, BIndTech error rate • Matched filter; • Digital modulation techniques • ASK, FSK, QAM, PSK/QPSK, CDMA and W-CDMA systems Signal space • Generalized orthonormal signals • Information measures-entropy • Channel capacity • Efficient encoding • Error correcting codes information theory • Data compression • Coding theory
Laboratory Equipment	See Annex IV

Course Name	**DIGITAL ELECTRONICS**
Course Description	This course covers the operation, application, and troubleshooting of TTL and CMOS electronic logic devices, their use in combinatorial and sequential logic circuits, the interface between logic families, and the interface between digital and analog circuits. The course also provides a study of Boolean algebra, number systems, binary codes, and the analysis of the basic components and circuits used in semiconductor switching.

Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronics Devices 2
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Basic Switching devices • Pulse • Number System and Codes • Logic Gates • Boolean Algebra • Timers, Triggers, Counters and 7-segment Display System • K map
Laboratory Equipment	See Annex IV

Course Name	**INSTRUMENTATION AND PROCESS CONTROL**
Course Description	This course covers the principles of energy conversion, the system by which these physical quantities are measured The topics include sensors and transducers, signal conditioning circuits, controllers, application, hardware, installation and performance of process measurement instrumentation and control valves.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronic Devices 2
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to process Control • Analog/Digital Signal Conditioning • Temperature • Pressure • Level and Flow
Laboratory Equipment	See Annex IV

Course Name	**SENSOR TECHNOLOGY**
Course Description	This course provides knowledge and understanding on sensors field usage and their role in control system which is divided into two topics. The first part deals with discrete and solid state devices wherein analog and digital signal voltage are applied and interface to microcontrollers and the second part focuses mainly on industrial applications being used for process control, automation and robotics

	which includes the interfacing with programmable logic controllers and computers.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronic Devices 2
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Different Types of Sensors according to: Capacitance, magnetism, inductions, piezoelectric and temperature • Sensor Technology (materials, surface processing, nanotechnology, types of sensors) • Proximity Sensors (magnetic proximity sensor, capacitive proximity sensor, ultrasonic proximity sensor, pneumatic proximity sensor) • Thermal Sensor (thermistor, bi metal strips and solid state temperature sensors) • Mechanical Sensors (displacement, location, or position sensors, resistive capacitive and inductive sensors, Variable Reluctance Sensors, LVDT, Level sensors, Load cells, Motion sensors, accelerometer, Pressure sensors, Magnetic Flow meter) • Optical sensors (optical proximity sensors, optical proximity sensors with fiber optic cable)
Laboratory Equipment	See Annex IV

Course Name	**MULTIMEDIA SYSTEMS**
Course Description	This course is designed to introduce industry standard multi-media tools, skills and equipment that the students can able to manipulate and design to create visual, aural, and written projects in both digital and print format. This course also aims to provide comprehensive information about indoor and outdoor stage lightings, LCD projectors and LED wall installation and maintenance.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electronic Devices 2
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Acoustic Technology • Audio and Video System (CCTV) • Analog and Digital Video System • Vision and graphic techniques for image communication • DMX Lighting system • LCD and LED displays

	• Internet Media • Animation and Graphics Interactive
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL ELECTRONICS**
Course Description	This course is a study of electronic/electrical control and instrumentation used in industry. Topics to include electrical and electronic control systems that include closed loop control systems and associated industrial control devices, transducers and sensors, thyristors, optoelectronics, electromechanical devices and electrical control diagrams.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Digital Electronics Instrumentation and Process Control Sensor Technology
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Closed loop control systems and associated industrial control devices • Transducers and sensors • Thyristors • Optoelectronics • Electromechanical devices and electrical control diagrams
Laboratory Equipment	See Annex IV

Course Name	**ELECTRO-PNEUMATICS SYSTEMS**
Course Description	This course covers the theory and operating characteristics of two hybrid system. It is the integration of electronics and pneumatics coupled by basic PLC programming as they relate to industrial automation. In this course the students will use relays, electric or electronics switches and sensors to control pneumatic circuits instead of the conventional mechanical controlling methods.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Industrial Electronics
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to pneumatics

	• Air generation and distribution • Directional control valve • Pneumatic cylinders • Flow control valves • Logic functions • Single/multiple actuators • Introduction to Electro pneumatics • Logic operations • Limit switches • Proximity switches • Sequence control
Laboratory Equipment	See Annex IV

Course Name	**PROGRAMMABLE CONTROLLERS**
Course Description	This course introduces Programmable Logic Controllers (PLC) and elements needed for an automated industrial control system. Introduces memory and project organization within a PLC and provides instruction in basic numbering systems, computer and PLC terminology. Introduces PLC control functions, program structures, language standards, wiring and troubleshooting methods, as well as, real world communications.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Electro Pneumatics Systems
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Overview of PLCs • Central Processing Unit • I/O System • Programming Terminals and Peripherals • Installation and Maintenance of PLCs • Relay Logic • Ladder Logic • Timers • Counters
Laboratory Equipment	See Annex IV

Course Name	**INDUSTRIAL ROBOTICS**
Course Description	This course integrates all laboratory applications in Sensor Technology, Electro-Pneumatics, Instruments and Process Control, Programmable Logic Controllers and includes Network Controller, Transmission Control Protocol-Internet Protocol (TCP-IP), Industrial Internet of Things (IIOT), Human Machine Interface, Image Graphical Recognition, Open Platform Communication-Unified Architecture (OPC-UA) Object-Linking and Simulation Based Technology.

Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Industrial Electronics
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Overview of Robotics System • Central Processing Unit • I/O System Configuration • Programming Terminals and Peripherals • Network configuration • Data Acquisition • Human Machine Interface (HMI) • Closed Loop Technology
Laboratory Equipment	See Annex IV

Course Name	**ELECTRONIC LAWS AND STANDARDS**
Course Description	This course is designed to prepare electronic technician/technologist students for professional practice and standards. Topic includes the knowledge and practice of electronic technicians/technologists stipulated in the RA9292 and other laws governing the profession, the Philippine Electronics Code, Radio Laws, Basic contracts and Ethics in relation to the electronic practice.
Number of Units for Lecture and Laboratory	3 units lecture
Number of Contact Hours per Week	3 hours lecture
Prerequisites	Electronics Communication 2
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• RA9292 • The manual of professional practice • RA 7925 • Radio Laws • RA3846 • RA 6541 • RA 8792 • Obligations and Contracts

Course Name	**PROJECT STUDY 1 WITH INTELLECTUAL PROPERTY RIGHTS**
Course Description	This course deals with the conceptualization of a project proposal based on the line of work/specialization of the student. It includes the study of research methodology as employed in applied research and the process of preparing a project report. The course also covers discussion of the different intellectual property rights such as patent, utility model, industrial design, copyright, trademark and trade secret. It also includes the governing intellectual property laws and an in-depth analysis of cases on IP violations and infringements as well as patent search and information strategies using various IP databases and the entire IP prosecution process.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	None
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Research • Intellectual Property Awareness and Orientation • Patent Search and Information Strategies • Introduction to Research: Research Problem and Objectives • Introduction to Research: Selecting the Best Solution • Conceptualizing Research Project Proposal • Project Proposal Writing • Research Ethics and Plagiarism • Proposal Oral Defense
Laboratory Equipment	Computer and any programming language and/or simulation software tool; materials, components and tools needed for prototype development and testing

Course Name	**PROJECT STUDY 2**
Course Description	The course deals with the project application wherein previous or new design shall be placed into actual prototypes, functional and operational in form and will be course for inspection and evaluation applying the requirements of good design and the criteria for design evaluation.
Number of Units for Lecture and Laboratory	2 units lecture; 1 unit laboratory
Number of Contact Hours per Week	2 hours lecture; 3 hours laboratory
Prerequisites	Project Study 1 with IPR
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Introduction to Project Development

	• Revisions of Project Proposal • Prototype Development • Documentation • Test and Evaluation • Final Oral Defense • Submission of final document
Laboratory Equipment	Computer and any programming language and/or simulation software tool; materials, components and tools needed for prototype development and testing

Course Name	**STUDENT INTERNSHIP PROGRAM 1**
Course Description	This course aims to develop industrial competencies of the students through direct exposure to actual work, strengthening the skills acquired from school. Students shall develop and implement desirable work haBIndTech and attitude required of an effective and productive labor force.
Number of Units for Lecture and Laboratory	6 units
Minimum Number of Hours Required for Industry Training	600 hours per semester
Prerequisites	Completed Academic Requirements
Co-requisites	None
Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Presentation of Policies and Guidelines • Multidisciplinary Team Approaches • Assertions of Student's OJT in the company • Submission of Progress Reports • Completion of 600 hours • Submission of Final Report

Course Name	**STUDENT INTERNSHIP PROGRAM 2**
Course Description	This course exposes the students to the actual workplace applying the basic and advanced skills. The students will be made to work in the industry with added exposure to management and supervisory work situation.
Number of Units for Lecture and Laboratory	6 units
Minimum Number of Hours Required for Industry Training	600 hours per semester
Prerequisites	Student Internship Program 1
Co-requisites	None

Program Outcomes	To be identified by the program
Course Outcomes	To be identified by the program
Course Outline	• Orientation and Presentation of Policies and Guidelines • Multidisciplinary Team Approaches • Assertions of Student's OJT in the company • Submission of Progress Reports • Completion of 600 hours • Submission of Final Report • Final Oral Presentation

ANNEX III
SAMPLE COURSE SYLLABUS

<table>
<tr><td colspan="4">I. UNIVERSITY VISION, CORE VALUES, MISSION, GOALS:</td></tr>
<tr><td>VISION:</td><td>MISSION:</td><td>INSTITUTIONAL GOALS:</td><td>INSTITUTIONAL OUTCOMES/GRADUATE ATTRIBUTES:</td></tr>
<tr><td colspan="4">II. PROGRAM/DEGREE: : Bachelor of Industrial Technology, major in Automotive Technology</td></tr>
<tr><td>III.COURSE NUMBER AND DESCRIPTIVE TITLE:
AUTOMOTIVE ELECTRICAL SYSTEM</td><td>IV. COURSE PREREQUISITE :
None</td><td>V. COURSE CREDIT/UNITS & CONTACT HOURS/WEEK:
3 Units (2units Lecture, 1 unit Laboratory) 5 hours/ week</td><td>VI. SEMESTER OFFERED, ACADEMIC YEAR :</td></tr>
<tr><td colspan="4">VII. COURSE DESCRIPTION:
This subject deals with the technological principles and practices used in modern automotive electrical systems. The operations of the electrical system from the generator, electronic ignition system, to electronic fuel control systems are examined.</td></tr>
<tr><td>VIII. PROGRAM/DEGREE OUTCOMES:
PROGRAM/DEGREE OUTCOMES:
(Legal Basis)</td><td>Common to all programs in all types of schools:</td><td>Common to the discipline:</td><td>Specific to Graduates of the BINDTECH program are technologists who can:
a. Ability to analyze broadly-defined industrial technology processes by using analytical tools that enhances creativity, innovativeness, and intellectual curiosity to improve methods,</td></tr>
</table>

			processes, and systems that meet the industry standards. b. Ability to design and implement broadly-defined industrial systems, components, products or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards. c. Ability to apply appropriate techniques, resources and state-of-the-art industrial technology tools to meet current industry needs and use these modern tools and processes to improve and increase entrepreneurial activities upholding the safety and health standards of business and industry. d. Ability to communicate with diverse groups of clienteles the appropriate cultural language with clarity and persuasion, in both oral and written forms, including understanding and giving of clear instructions, high comprehension level, effectiveness in delivering presentations and writing documents, and articulating technological innovation outputs.

			e. Ability to develop leadership and management skills in a team-based environment by making informed decisions, keeping team motivated, acting & delegating responsibility and inspiring positive changes in the organization by exercising responsibility with integrity and accountability in the practice of one's profession. f. Practice moral responsibilities of an industrial technologist to manage and balance wider public interest and uphold the norms and safety standards of the industrial technology profession. g. Ability to demonstrate enthusiasm and passion for continuous personal and professional development in broadly-defined industrial technology and effecting positive changes in entrepreneurial and industrial endeavor. Recognition of the need for, and an ability to engage in life-long learning.

COURSE MAP

Course Outcomes	Institutional Outcomes (IO)										Program Outcomes (PO) *(Note: Add/delete column(s) based on the number of PO from the CMO)*														
	1						2		3		Common to all programs in all types of school					Common to the discipline				Specific to Bachelor of Industrial Technology						
At the end of the course, the students must have:	a	b	c	d	e	f	a	b	a	b	a	b	c	d	e	a	b	c	d	a	b	c	d	e	f	g
1. gained the concepts, principles and theories in fundamental of electricity, magnetism, basic electronics and computer system that are applicable to their actual servicing and repair of various automotive electrical components and accessories.	/		/			/				/										/		/				/
2. acquired critical thinking and manipulative skills in servicing and repair of electrical components, electronics and computer systems		/				/														/		/				/
3. acquired manipulative skills in automotive electrical system and troubleshooting		/								/												/				

LEARNING PLAN:

DESIRED LEARNING OUTCOMES	COURSE CONTENT/SUBJECT MATTER	TEXTBOOKS/REFERENCES	TEACHING AND LEARNING ACTIVITIES (TLAS)	ASSESSMENT TASKS (ATs)	RESOURCE MATERIALS	TIMETABLE
At end of the unit, the students must have: identified, described, and explained the vision, mission, core values of the university and the institutional, college degree and course outcomes.	**Unit 0: Mission, Vision, Core values, and outcomes** • The university vision, mission, core values and outcomes • The College of Industrial Technology outcome • The BINDTECH-AT degree program The Course/subject Outcomes	• Student Handbook • Bulletin of Information	Synchronous or Asynchronous method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc.	• Self -check Asking some trigger questions	• Multi Media system	3 hr (week 1)
1. discussed various safety precaution in the shop 2. explained the operating principles	**1.0 Introduction to Automotive Electricity** 1.1 safety in the shop	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Grouches, C. Automotive electrical and electronics	Synchronous or Asynchronous method using different	• Self -check • Asking some trigger questions	• videos • Printed and digital Modules • E-books	6 hrs (week 1-2)

of electrical and electronics system, their components parts and functions. 3. discussed the various procedure in serving electronics electrical system components used the most appropriate measuring tools / instruments.	1.2 hand tools and precision instruments	system, laboratory and classroom manual, 3rd ed. 1994	platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc			
1. performed the different operation involved in various measuring tools instruments 2. performed preventive maintenance for each testing instrument				•	•	
1. explained and discussed atomic structures 2. explained and discussed electrical conductors and insulators	**2.0 Fundamentals of Electricity and Magnetism** 2.1 Atomic structure and conductivity 2.2 Electrical conductors and insulators	Websters, jan, automotive electricity and electronics, Glenco Pub. Co. 1989 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method	• Self - check • Asking some trigger questions	• videos • Printed and digital Modules • E-books	8 hrs (week 2-3)

3. identified electrical circuits 4. explained electrical values 5. discussed and compute electrical measurement 6. discussed magnetism and electro-magnetism 7. identified electrical symbols 8. identified basic electrical components	2.3 Electrical circuits 2.4 electrical values 2.5 electrical measurement 2.6 magnetism and electro-magnetism 2.7 Electrical symbols 2.8 Basic electrical component		such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	•	•	
1. discussed purpose and operating principle of the battery 2. discussed and identified battery components and design 3. discussed battery ratings 4. performed battery testing and servicing 5. discussed battery efficiency	**3.0 Storage Battery** 3.1 Purpose and operating principles 3.2 Construction, component and design 3.3 Battery ratings 3.4 Battery testing / servicing 3.5 Battery efficiency 3.6 Battery charging	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger,	• Self -check • Asking some trigger questions	• videos • Printed and digital Modules • E-books •	8hrs (week 3-4)

6. performed battery charging			Google meet, etc			
1. discussed parts and function of starter motor 2. discussed structure and components parts of starter motor 3. discussed and identify starter motor types 4. discussed operating principle of starter motor 5. performed testing and servicing starter 6. discussed starter troubleshooting and diagnosis 7. drawn and analyzed schematic	**4.0 Starting System** 4.1 Parts and Function of starter 4.2 Construction and components parts 4.3 Types of starter motor 4.4 Operating principles 4.5 Testing / servicing 4.6 Troubleshooting and diagnosis 4.7 Wiring and rewiring starting system 4.8 Schematic diagram of a starting system	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	• Self -check • Asking some trigger questions	• videos • Printed and digital Modules • E-books •	8 hrs (week 4-5)

diagram of starting system 9. performed wiring and rewiring starting system						
1. discussed function of ignition system 2. discussed and identified components of ignition system 3. discussed operating principle of ignition system 4. discussed and explained types and classification 5. discussed ignition system circuits 6. drawn and analyzed schematic diagram 7. performed testing and servicing ignition system 8. discussed ignition trouble and diagnosis	**5.0 Ignition System** 5.1 Function of ignition system 5.2 component of the ignition system 5.3 Working principles of ignition system 5.4 Types / Classification of ignition systems 5.5 Ignition system circuits 5.6 Schematic diagram of ignition system 5.7 Testing and servicing ignition system 5.8 Ignition troubles and their remedies 5.9 Troubleshooting and diagnosis	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	• Self -check • Asking some trigger questions	• videos • Printed and digital Modules • E-books	8 hrs (week 8-9)

9. performed wiring and servicing ignition 10. performed ignition timing	5.10 Ignition timing					

MIDTERM EXAMINATION 2 hours (Week 9)						
1. discussed and identified parts and function of charging system 2. discussed operating principle of charging system 3. identified types and classification of charging system 4. drawn and interpreted schematic diagram of charging system	**6.0 Charging System** 6.1 parts and function of charging system 6.2 operating principles of charging system 6.3 types and classification of charging system	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	Circuit diagramming and analysis	• videos • Printed and digital Modules • E-books	8hrs (week 10-11)
5. performed testing and servicing charging system 6. performed troubleshooting and diagnosis	6.4 schematic diagram of charging system 6.5 testing and servicing charging system 6.6 charging troubles and diagnoses				•	

1. identified types and classification of lighting system 2. discussed and identify automotive bulbs 3. discussed the operation and identify lighting switches 4. identified electrical symbols 5. drawn and analyzed schematic diagram 6. identified wiring sizes 7. performed rewiring lighting system	**7.0 Lighting System** 7.1 types/ classification of lighting circuits 7.2 automotive bulbs 7.3 lighting switches and safety devices 7.4 electrical symbol 7.5 schematic diagram of lighting system 7.6 wire sizes and harness 7.7 wiring and rewiring lighting system	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	• Self - check • Asking some trigger questions	• videos • Printed and digital Modules • E-books •	12 hrs (week12 -14)
1. explained and identified parts and function of windshield wiper 2. discussed operating principle of wind shield wiper 3. drawn and interpreted schematic diagram 4. performed wiring windshield wiper system	**8.0 Wind shield wiper** 8.1 parts, functions, types, construction of windshield wiper motor 8.2 operating principle of windshield wiper 8.3 schematic diagram of windshield wiper 8.4 wiring windshield wiper	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	• Self - check • Asking some trigger questions •	• videos • Printed and digital Modules • E-books •	8 hrs (week 14-15)

5. discussed and identified types and functions of horns and buzzer 6. discussed design and construction of horn and buzzer 7. drawn and interpreted schematic diagram 8. performed wiring of horn and buzzer alarm system	**9.0 Horns and Buzzer warning system** 9.1 function, types and classification 9.2 design, parts and construction 9.3schematic diagram of horn system wiring/rewiring horn and buzzer alarm system	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	• Self - check • Asking some trigger questions •	• videos • Printed and digital Modules • E-books •	8 hrs (week 16-17)
1. discussed operating principle of thermal gauges 2. discussed functions and operating principle of electromagnetic gauges 3. identified instruments cluster and indicator lights 4. discussed operating principle of electronic 9. instrumentation displays	**10.0 Instruments panel gauges and indicator lights** 10.1 thermal electric gauge 10.2 electromagnetic gauge 10.3 instruments cluster indicator lights 10.4 electronic instrumentation displays	Course, William , et al., Automotive Mechanics 10th ed. McGraw Hill book Co. 1994 Anderson, Edwin, Andel Gas manual, Howard W. Sams Co. Inc. 1985	Synchronous or Asynchronus method using different platform method such as Virtual Learning Environment (VLE), Messenger, Google meet, etc	• Self - check • Asking some trigger questions	• videos • Printed and digital Modules • E-books •	5 hrs (week 17-18)
FINAL EXAMINATION 2 hours (week 18)						

COURSE REQUIREMENTS:

CRITERIA FOR GRADING:

(Note: In the normal course of operation, this course syllabus shall be revisited every two years for possible revision of its content. If new DepEd/CHED programs, CMO's and university policies or other policies that will greatly affect the course content, it shall be revised immediately to cater to the demands of the new programs, CMO's, policies, etc.)

Latest revision date:

Prepared by:

Instructor/Professor

NOTED:

Dept. Head/Program Coordinator

CONCURRED:

Dean/Head of Instruction

Date Signed: _____

APPROVED:

VPAA/Campus Administrator

Date Signed: _____

ENHANCEMENTS TO BE CONSIDERED DURING REVISION Note: This page shall be reserved for suggested revisions which will be taken up during the deliberation/revisit of the course syllabus. Revisions may be in the form of the methods of teaching, references, and logical flow of the course topics, the style of evaluation, and anything that will effectively produce positive results.	
Date	Suggested Enhancement/Teacher

ANNEX IV

LABORATORY REQUIREMENTS

ANNEX IV

LABORATORY REQUIREMENTS

A. BACHELOR OF INDUSTRAL TECHNOLOGY with major in Automotive Technology - BINDTECH-AT

LABORATORY REQUIREMENTS

APPLIED COURSES

Industrial Drawing

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Computer Aided Design software	1:1 ratio

Introduction to Information Technology

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Application software	1:1 ratio

Computer Programming

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Programming language environment	1:1 ratio

PROFESSIONAL COURSES

Fundamentals of Automotive Technology

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Lifting Equipment ,Hoist (1 to 3 Tons) - Hand Pallet Truck - Assorted Jigs/fixtures	 1 1 1	 1 1 1
Hand Tools - Socket set with handles (mm)	 1	 5

- Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torx remover wrench - file set - cutting tool (hacksaw, chisel)	1 1 1 1 1 1 1 1 1 1	5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	5
Impact wrench ½ drive	1	5
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Automotive Electrical

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Equipment: - Battery charger/booster 12V/24V DC - Spark plug tester/cleaner - Headlight aimer testing equipment - distributor test bench - Headlight aimer testing equipment - Armature gromer	 1 1 1 1 1 1	 1 1 1 1 1 1
Hand tools and Special - Combination wrench (mm) - Socket wrench ¼", 3/8" drive (mm) - Screwdrivers set - Allen set - Torx driver set - Jewelry screwdriver set	 1 1 1 1 1 1 1	 5 5 5 5 5 5 5
Hydrometer	1	5
Multimeter	1	5
Tachometer	1	5
Timing light	1	5

Fender cover	1	5
Test light (12V and 24V)	1	5
Trouble light AC 220V/ 12V DC	1	5
soldering equipment	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Automotive Electronics System

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Oscilloscope	1	5
Hand tools and Special - Combination wrench (mm) - Socket wrench ¼", 3/8" drive (mm) - Screwdrivers set - Allen set - Torx driver set - Jewelry screwdriver set	 1 1 1 1 1 1	 5 5 5 5 5 5
Hydrometer	1	5
Multimeter	1	5
Tachometer	1	1
Timing light	1	1
Fender cover	1	5
Test light (12V and 24V)	1	1
Trouble light AC 220V/ 12V DC	1	1
soldering equipment	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Small Engine Repair and Motorcycle Servicing

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Motorcycle service lifting rack - Air compressor - Waste Oil drainer	 1 1 1	 1 1 1

Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Automotive CAD

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Equipment: - Computers - Computer tables - Chairs - Air-conditioning system 3 ton cap, split - Printer - LED HDTV	 1 1 1 1 1 1	 5 5 5 5 5 5
Accessories: - CAD program installer (licensed) - External storage - Keyboards - Mouse - Internal Disc drive - Speaker set	 1 1 1 1 1 1	 5 5 5 5 5 5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Car Care Servicing, Emission Control and Tune-up

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Two post lifter 2-3 ton capacity - Transmission jack - Gas smoke analyzer, 5 gas reading - Opacimeter (diesel) - Air compressor - Waste Oil drainer	 1 1 1 1 1 1	 1 1 1 1 1 1
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Body Repair and Painting

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Painting booth - Air compressor - Sediment filter - MIG/TIG machine - AC/DC welding machine - Gas (oxy/acetylene) welding kit/tanks	 1 1 1 1 1 1	 5 1 1 5 5 5

- Sheet bender machine - Sheet cutter machine - Drll press - Electric or pneumatic hand drill	 1 1 1 1	 1 1 1 1
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - file set - cutting tool (hacksaw, chisel, tinner snip)	 1 1 1 1 1 1 1	 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Angular grinder	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers	1	1
Body repair /dent repair hammer set	1	5
Dent puller	1	1
Dollies	1	5
Pin punch	1	5
Pipe wrench	1	5
Prybar	1	5
Pull rod	1	5
Scraper	1	5
Tap and die set	1	5
Suction cup	1	5
Pull push rule	1	5
Try square	1	5
Wire brush	1	5
Spray gun	1	1
Riveting tool	1	5
Buffing machine	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Power Train and Conversion System

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Two post lifter 2-3 ton capacity - Transmission jack - Degreaser machine - Air compressor - Waste Oil drainer - Crocodile jack	 1 1 1 1 1 1	 1 1 1 1 1 1
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Torque wrench – dial type	1:1	5
Special tools (assorted)	1:1	5
Rubber Mallet	1:1	5
Sealer gun – pneumatic	1:1	1
Pullers	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

BINDTECH-AT-Laboratory

Engine Overhauling and Performance Testing

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment: - Two post lifter 2-3 ton capacity - Transmission jack - Chain block 1 ton - Air compressor - Waste Oil drainer	 1 1 1 1 1	 1 1 1 1 1

- Scan tool - Test bench/ overhauling rack - Valve refacer machine - Cylinder head/block refacer (optional) - Cylinder block honing (optional) - Injector Tester machine - Calibration machine (optional) - Crocodile jack 2000kgs cap.	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1
Measuring tools: - Cylinder compression tester - Vacuum tester - Digital temperature tester - Coolant leak tester - Tachometer - Multitester - Dial gauge indicator - Cylinder bore gauge - Micrometer. metric - Vernier caliper - Feeler gauge - Brass ruler	1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 5 1 1 5 5 5 5
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - Allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers set	1	1
Magnetic stand	1	1
Piston ring expander	1	5

Piston ring compressor	1	5
Valve spring compressor	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Hybrid and Electric Vehicle

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment's:		
- Electric car model	1	1
- Hybrid car model	1	1
- Two post lift	1	1
- Battery charging machine	1	1
- Scan tool	1	1
- Oscilloscope	1	1
- Gas analyser	1	1
- LED HDTV	1	1
Measuring tools:		
- Digital temperature tester	1	1
- Multitester	1	1
Hand tools:		
- Socket set	1	1
- Combination wrench set	1	1
- Special tools set	1	1
- Pliers	1	1
- Mechanics hammer set	1	1
- Puller set	1	1
- LED test lamp	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Automotive LPG System

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Equipment:		
- Two post lifter 2-3 ton capacity	1	1
- LPG car model	1	1
- Transmission jack	1	1
- Gas smoke analyzer , 5 gas reading	1	1
- Electric hand drill	1	1
- Crocodile jack 2000 kgs cap.	1	1
- Fire extinguisher	1	1

Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Drill bets	1	5
Tube bender	1	5
Flaring tool	1	5
Tube cutter	1	5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Pullers	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Automotive Air Conditioning

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Equipment: - Refrigerant recovery machine - Air compressor - Vacuum pump - Battery charging machine	 1 1 1 1	 1 1 1 1
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10"	 1 1 1 1 1 1	 5 5 5 5 5 5

- allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	1 1 1 1 1	5 5 5 5 5
Manifold gauge	1	5
Manifold gauge charging adopter	1	5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers	1	1
Multi tester	1	5
Temperature tester	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Body Management and Underchassis Electronic Control System

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Equipment: - Two post lifter 2-3 ton capacity - Transmission jack - Brake Lathe machine - Air compressor - Waste Oil drainer - Wheel alignment - Pneumatic tire changer - Wheel balancer	 1 1 1 1 1 1 1 1	 1 1 1 1 1 1 1 1
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1

Impact wrench ½ drive	1	1
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Driving Education

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Driving car	1	1
Equipment and tools: - Battery charger - Portable hydraulic jack - Tire wrench - Combination wrench set - Socket wrench set - Screwdrivers set - EWD - Barrier plastic cone set	 1 1 1 1 1 1 1	 1 1 1 1 1 1 1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electronics Engine Management Control System

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Equipment: - Two post lifter 2-3 ton capacity - Transmission jack - Chain block 1 ton - Air compressor - Waste Oil drainer - Scan tool - Test bench/ overhauling rack - Valve refacer machine - Cylinder head/block refacer (optional) - Cylinder block honing (optional) - Injector Tester machine - Calibration machine (optional)	 1 1 1 1 1 1 1 1 1 1 1 1	 1 1 1 1 1 1 1 1 1 1 1 1

Measuring tools: - Cylinder compression tester - Vacuum tester - Digital temperature tester - Coolant leak tester - Tachometer - Multitester - Dial gauge indicator - Cylinder bore gauge - Micrometer. metric - Vernier caliper - Feeler gauge - Brass ruler	 1 1 1 1 1 1 1 1 1 1 1 1	 1 1 1 1 1 5 5 1 5 5 5 5
Hand Tools - Socket set with handles (mm) - Screwdrivers - mechanics hammer set - pliers set - combination wrench set - extension bar 6'. 10" - allen set (mm) - adjustable wrench 12" 15" - torque remover wrench - file set - cutting tool (hacksaw, chisel)	 1 1 1 1 1 1 1 1 1 1 1	 5 5 5 5 5 5 5 5 5 5 5
Impact wrench ¾ drive	1	1
Impact wrench ½ drive	1	1
Torque wrench – dial type	1	5
Special tools (assorted)	1	5
Rubber Mallet	1	5
Sealer gun – pneumatic	1	1
Pullers set	1	5
Magnetic stand	1	1
Piston ring expander	1	5
Piston ring compressor	1	5
Valve spring compressor	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

B. BACHELOR OF INDUSTRAL TECHNOLOGY with major in Electrical Technology - BINDTECH -ELT

LABORATORY REQUIREMENTS

APPLIED COURSES

Industrial Drawing

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Computer Aided Design software	1:1 ratio

Introduction to Information Technology

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Application software	1:1 ratio

Computer Programming

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Programming language environment	1:1 ratio

PROFESSIONAL COURSES

Electricity and Electronics Principles

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Pliers, flat nose	1	5
Pliers, Long nose	1	5
Pliers, diagonal cutter	1	5
Screw Driver, flat	1	5
Screw Driver, philip	1	5
Multi-tester	1	1
Breadboard	1	5

Soldering iron	1	5
Oscilloscope	1	1
Variable DC Power supply 12VDC	1	1
Transformer Rewinder, portable	1	5
Lead sucker	1	5
PCB Drill	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

DC Circuits

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Pliers, flat nose	1	5
Pliers, Long nose	1	5
Pliers, diagonal cutter	1	5
Screw Driver, flat	1	5
Screw Driver, philip	1	5
Multi-tester	1	1
Breadboard	1	5
Soldering iron	1	5
Oscilloscope	1	1
Variable DC Power supply 12VDC	1	1
Transformer Rewinder, portable	1	5
Lead sucker	1	5
PCB Drill	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Shop Processes, Tools and Equipment

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Claw Hammer	1	5
Ballpeen Hammer	1	5
Chipping Hammer	1	5

Pull push rule	1	5
Chisel	1	5
Bar Level	1	5
Screw Drivers	1	5
Try square	1	5
Steel Square	1	5
Plumbob	1	5
Cross-cut-saw	1	5
Hack saw	1	5
Back Saw	1	5
Center punch	1	5
Smooth File	1	5
C-Clamp	1	5
Wooden Mallet	1	5
Shears	1	5
Portable Grinder	1	1
Welding Machine	1	1
Portable grinder	1	1
Cut off Machine	1	1
Jig Saw	1	1
Anvil	1	1
Bench vise	1	1
Pipe vise	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

AC Circuits

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Breadboard	1	5
Oscilloscope	1	1
AC Signal Generator	1	1
Variable DC Power supply	1	1
Power Factor meter	1	1

Millimeter	1	1
Electrician pliers	1	5
Screwdrivers set	1	5
Wire splicer	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electrical Instruments and Measurements

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
AC Ammeter	1	1
DC Ammeter	1	1
Multimeter	1	1
Power factor meter	1	1
Oscilloscope		1
AC voltmeter	1	1
DC voltmeter	1	1
Signal generator		1
Frequency meter	1	1
Current transformer	1	1
Power transformer	1	1
Wattmeter	1	1
Ohmmeter	1	1
Potentiometer	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Residential Wiring Systems

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Spirit level	1	1
Pipe cutter	1	1
Pipe reamer	1	1
Pipe threader	1	1

Pipe bender	1	1
Bolt cutter	1	1
Ball hammer	1	1
Electrician pliers	1	5
Screwdrivers set	1	5
Box Wrench	1	1
Wire splicer	1	1
Electrician knife	1	1
Tools holster	1	1
Push-pull 0-5 mtrs	1	1
Claw hammer	1	1
Prick punch	1	1
Heat gun 1200 watts	1	1
Heavy-duty soldering iron	1	1
Flat file smooth 8"	1	1
Electric drill	1	1
Portable grinder	1	1
Multi-tester	1	1
Fire alarm system (5units detector, 1 control panel)	1	1
Motion sensors	1	1
Security equipment Access Control		1
CCTV (4 cameras, 1 DVR)		1
Clamp-on meter	1	5
Insulation Resistance Tester	1	1
Earth resistance tester		1
Labeling machine	1	1
Fire extinguisher KGS ABC		1
LCD Projector		1
Laptop		1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Industrial Motor Controllers

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Pliers, flat nose	1	5
Pliers, Long nose	1	5
Pliers, diagonal cutter	1	5
Screw Driver, flat	1	5
Screw Driver, philip	1	5
Crimping tools	1	5
Wire splicers/strippers	1	5
Multi-Tester/VOM	1	1
Insulation Tester	1	1
Spirit level	1	1
Hack saw	1	1
Pipe cutter	1	1
Pipe reamer	1	1
Pipe threader	1	1
Pipe bender	1	1
Bolt cutter	1	1
Ball hammer	1	1
Box Wrench	1	1
Wire stripper	1	5
Electrician knife	1	1
Tools holster	1	5
Push-pull 0-5 mtrs	1	5
Claw hammer	1	1
Electric drill	1	1
Portable grinder	1	1
Automatic Voltage Regulator (AVR)	1	1
Clamp-on meter	1	1
Insulation Resistance Tester	1	1
Earth resistance tester	1	1
Labeling machine	1	1
Fire extinguisher KGS ABC		1

Induction motors, single phase,	1	1
Induction motors, three phase,	1	1
DC Motors	1	1
Reduced voltage controllers	1	1
Variable Frequency Drive		1
LCD Projector		1
Laptop		1
Working gloves	1	5
Safety shoes	1	5
Hard hat	1	5
Safety goggles	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electrical Machines

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Hand Tools		
Pliers, flat nose	1	5
Pliers, Long nose	1	5
Pliers, diagonal cutter	1	5
Screw Driver, flat	1	5
Screw Driver, philip	1	5
Bearing Puller	1	1
Pipe vise	1	1
Ball Hammer	1	1
Wooden/rubber mallet	1	1
Close or open ended Wrenches (set)	1	1
Pipe wrench	1	1
Lock on wrench	1	1
Socket wrench		
Hacksaw	1	1
Scissor	1	5
Wire gauge	1	1

Multi tester	1	1
Insulation Resistance Tester	1	1
Tachometer	1	1
Thermal scanner, industrial	1	1
Clamp-on ammeter	1	1
Power meter		1
Induction motors, single phase	1	1
Induction motors, three phase	1	1
Repulsion Motor		1
DC Motors	1	1
Distribution transformers		1
Generator		1
Baking Cabinet		1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Logic Circuits

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Logic gate trainer	1	1
Oscilloscope	1	1
signal generators	1	1
Multimeter	1	1
Curve tracer	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Power Production and Management System

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Power Meter Data Logger		1
Oscilloscope	1	1
Multi Meter	1	5
Lux Meter	1	1
Ammeter, Clamp-on	1	1

Thermo scanner	1	1
Computer set	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

BINDTECH -ELT Laboratory

Industrial Wiring System

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Spirit level	1	1
Pipe cutter	1	1
Pipe reamer	1	1
Pipe threader	1	1
Pipe bender	1	1
Bolt cutter	1	1
Ball hammer	1	1
Electrician pliers	1	5
Screwdrivers set	1	5
Box Wrench	1	1
Wire splicer	1	1
Wire stripper	1	1
Electrician knife	1	1
Tools holster	1	1
Push-pull 0-5 mtrs	1	1
Claw hammer	1	1
Prick punch	1	1
Heat gun 1200 watts	1	1
Heavy-duty soldering iron	1	1
Flat file smooth 8"	1	1
Electric drill	1	1
Portable grinder	1	1
Multi-tester	1	1
Fire alarm system (5units detector, 1 control panel)	1	1
Motion sensors	1	1

Security equipment Access Control		1
CCTV (4 cameras, 1 DVR)		1
Clamp-on meter	1	5
Insulation Resistance Tester	1	1
Earth resistance tester		1
Labeling machine	1	1
Fire extinguisher KGS ABC		1
LCD Projector		1
Laptop		1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Transmission and Distribution Systems

Required Tools/Equipment	**Required Quantity Per Group**	**Minimum Required Quantity**
Tools		
Ordinary shovel	1	1
Spoon shovel, 7 ft	1	1
Straight shovel, 7 ft	1	1
Digging/tamping bar, 8', forge steel	1	1
Pole pike, assorted size	1	2
Pole Jenny (salagunting), 14 ft.	1	1
Pole Jenny (salagunting), 18 ft.	1	1
Butting board (1"x6"x7' wood or steel)	1	1
Cant hook	1	1
Bolt cutter, 24" or 36"	1	1
Auger BIndTech, ¾", 5/8" and 11/16"□	1	1
Rachet, 1.5 tons	1	1
Cum-a-long (wire grip	1	1
Secondary rack (J2)	1	1
Transformer gin	1	1
Bull Line (3/4" @ Polypropylene rope)	1	1
Hand line (1/2"□ rope	1	1
Crimping Tool of various sizes	1	1

Pruning saw of various sizes	1	1
Hotstick	1	1
Shotgun stick		1
Grounding cluster		1
Linemen's pliers, 9", insulated handle	1	5
Adjustable wrench, 12"	1	5
Ball-peen hammer, 2 lbs; forge steel	1	5
Screw driver, 12", flat	1	5
Adjustable wrench, 12", forge steel	1	5
Skinning knife, 2 ¼", insulated	1	5
Canvas bag	1	5
Equipment		
Pole climbing equipment		2
Hole digger 6' or 8'	1	1
Telescopic ladder		2
KWH meter, 1□ 10 (30)A, bottom connection	1	1
DX transformer, 10 KVA	1	1
Boom truck (with auger & man lift (optional)		1
Block and Tackle, single 5", 3/8", MSL 227 kg		1
Double Block, 5", 3/8", MSL 338 kg		1
Stringing roller & block, brass steel		1
Personal Protective Equipment		
Class E Hard hat (full brim)	1	5
Safety spectacles	1	5
Working gloves	1	5
Over-all clothes	1	5
Full-body harness with big hook lanyard	1	5
Robber gloves	1	5
Safety shoes, high cut with heels	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Programmable Logic Controllers

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Crimping tools	1	5
Pliers	1	5
Wrenches (box & open)	1	1
Wire splicers/strippers	1	5
Pull-push meter	1	5
Power supply	1	1
Automatic Voltage Regulator (AVR)	1	1
Un-interruptible power supply (UPS)	1	1
Generators and motors	1	1
Inverters/Rectifiers	1	1
Controller	1	1
PLC Simulator Software	1	1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electrical Computer Aided Design

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Computer set	1	5
Autocad Software		1
Printer or plotter		1

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electro-Pneumatics System

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Crimping tools	1	5
Pliers	1	5
Wrenches (box & open)	1	1
Wire splicers/strippers	1	5

Pull-push meter	1	5
Power supply	1	1
Automatic Voltage Regulator (AVR)	1	1
Un-interruptible power supply (UPS)	1	1
Controllers	1	1
Electro-Pneumatic controller	1	1
Pressure gauge	1	1
Pressure Analyzer/Gauge manifold	1	1
Air Compressor unit		1
Leak tester		1
Micro PLC		1
PLC Simulator Software		1
Electro-pneumatics Software		1
Computer set	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

C. BACHELOR OF INDUSTRAL TECHNOLOGY with major in Electronics Technology - BINDTECH -ELX

LABORATORY REQUIREMENTS

APPLIED COURSES

Industrial Drawing

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Computer Aided Design software	1:1 ratio

Introduction to Information Technology

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Application software	1:1 ratio

Computer Programming

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Programming language environment	1:1 ratio

PROFESSIONAL COURSES

Electronic Devices 1

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Open or commercial simulation tools in Electronic Devices	1	5
Variable Power Supply (0-20V DC and 0-5V AC)	1	5
VOM	1	5
Breadboard	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electronic Devices 2

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Oscilloscope	1	5
Function Generator	1	5
Curve Tracer	1	5
Semiconductor devices such as transistors, amplifiers, etc.	1	5
Transistor amplifier circuit board	1	5
Transistor power amplifier circuit board	1	5
FET circuit board	1	5
Operational amplifier circuit board	1	5
Transistor feedback circuit board	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electronic Communications 1

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Communication Trainer	1	5
Frequency Counter	1	5
Oscilloscope	1	5
Signal Generator	1	5
AM Receiver	1	5
FM Receiver	1	5
Television receiver	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electronic CAD

Required Tools/Equipment	Required Quantity
Complete set of computer system	1:1 ratio
Programming language environment	1:1 ratio

Electronic Communications 2

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Computer Hardware & Software	1	5
MODEMS	1	5
Data Switcher	1	5
Or Data Communication Trainer		

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Digital Electronics

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Open or commercial simulation tools in Digital Electronics	1	5
Power Supply	1	5
Breadboard	1	5
Complete set of different logic gates	1	5
Logic Probe	1	5
Oscilloscope	1	5
Digital circuit training module	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Instrumentation and Process Control

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Process Variable Trainer (Flow, level, Temperature or Pressure)	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Sensor Technology

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Sensor Set of Discrete and Solid state sensor module	1	5
Industrial Type Sensor Module	1	5
PLCs and HMIs Trainer Module	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Multimedia Systems

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete Set of Computer System	1	5
License Application Software/Simulation	1	5
Audio Video Set Modules	1	5
Signal Management and Control Modules	1	5
Digital and Streaming Media Modules	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Industrial Electronics

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Thyristors and Power Devices	1	5
Industrial Electronics Trainer	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Electro Pneumatic Systems

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Process Variable	1	5
Electro Pneumatic Trainer Module	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Programmable Logic Controllers

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
PLC Module	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students

Industrial Robotics

Required Tools/Equipment	Required Quantity Per Group	Minimum Required Quantity
Complete set of computer system	1	5
Network System	1	5
Human Machine Interface Module	1	5
Image Graphical recognition	1	5
OPC UA Network System	1	5
Simulation Base Technology	1	5

*Maximum of 5 students per group and minimum required quantity is based on a class size of 25 students