GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)Semester –VI

Course Title: Project

(Course Code: 4362401)

Diploma programme in which this course is offered	Semester in which offered
Power Electronics	6th Semester

1. RATIONALE

The diploma power electronics engineers are required to work in industry to test and troubleshoot electrical and electronics components devices and circuits for diagnose problems and repair respective circuits. The students need to have industry or practical workshop exposure, where they can experience real life equipment, materials, and instruments with various circuits. This course has been designed for the students to have real life experiences to help them prepare for their career.

Project is Full Semester Internship cum industrial training an essential part of the Diploma in power electronics engineering curriculum as it offers students the opportunity to gain practical experience in therelevant industry. The rationale behind including project cum internship cum industrial training in the curriculum is to provide students with a hands-on experience of the theoretical concepts they learn in the classroom. It helps them to gain real-world exposure and apply their theoretical knowledge topractical problems in the industry.

Project cum Industrial training provides students with the opportunity to work alongside professionals in the industry and learn from their expertise. This type of exposure helps students to understand the practical challenges of the industry and to develop solutions to address them.It also enables students to learn about the latest technological advancements in the field and gain insight into emerging trends in the industry.

Another important aspect of project cum industrial training is that it helps students to develop essential soft skills such as communication, teamwork, and problem-solving. These skills are essential for success in the industry, and industrial training provides a unique opportunity for studentsto develop them in a real-world environment.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency.

- **Successfully plan and execute assigned work while adhering to safety standards and following industry standard procedures, as a team member/individual in Industry and/ or workshop with professionalism and a commitment to lifelong learning.**

3. COURSE OUTCOMES (COs)

The underpinning knowledge and the relevant skills associated with this competency are to be developed in the student to display the following COs:

a) **Outline all the details of the work that has been assigned to him or her.**
b) **Gather and maintain all necessary materials, including devices, components, circuits, instruments, tools, machines, and other requirements, on schedule.**
c) **Execute the assigned work safely and in accordance with established procedures, either as an individual or as part of a team.**
d) **Utilize the latest industrial machinery and equipment, along with appropriate tools, measuring instruments, testing, and maintenance equipment.**
e) **Consistently maintain work records and deliver a project report based on work experience via verbal and written means of communication.**
f) **Work on developing soft skills such as teamwork and collaboration, leadership, time management, working outside of one's comfort zone, adaptability, flexibility, presentation, and analytical ability.**
g) **Follow and uphold the waste management procedures implemented by the industry to safeguard the environment.**
h) **Develop technical skill such as designing, testing, maintaining and troubleshooting of various power electronic circuits and soft skill such as sales and marketing and supply management.**

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	0	28**	14	00	00	500	200*	700

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** - End Semester Examination.*

***Indicate External exam marks for practical. (20 students per day will be examined by externalexaminer.)**

****Indicate load of teaching faculty per week per batch for following criteria,**

1. For placing students in training at industry. OR for the guidance of project work at college.
2. For checking weekly report for individual students and evaluating on weekly basis.
3. Continuous supervision and monitoring of each student will be done throughout the entire semester.
4. Assigned faculty will conduct a minimum of one follow-up visit per month to the training site/workshop to ensure their progress. Additionally, the (faculty) internal examiner will perform continuous evaluations during their monthly visits to the industry.
5. Students are expected to make monthly visits to the institute to present their monthly

project work cum training progress using PPT presentations. Assigned faculty has to conduct continuous assessments during these visits.

6. The faculty will assist the students in preparing their final presentation and training report, and also review and evaluate the final presentation and report.

- **Continuous Assessment (CA)**

  Internal Faculty should evaluate project/training on following criteria and marks-(Max. Marks=500)

  1. **Monthly Presentation with PPT / speak out-(Maximum 150 Marks):** Three monthly presentations of 50 marks each during monthly visits of student to institute
  2. **Review of Log Book, weekly report (Form-3) & Monthly Report (Form-4) (Maximum 150 Marks):** 50 marks for each monthly review during visit of teacher to industry/college workshop (three visits).
  3. **Final project report at the end of training by Internal Faculty-(Maximum 100 Marks).**
  4. **Internal presentation and viva by internal Faculty (Maximum 100 Marks)** at the end of the semester.

- **End Semester External Examination (ESE)**

  Evaluation of ESE will be done by the External exam for practical (20 students per day (six hours) will be examined by external examiner.) External examiner should evaluate training on following criteria and marks-(Max. Marks=200)

  External Presentation/ viva - (Maximum 200 Marks): Which includes Review of training cum project work in industry/ project work at college- (Maximum 100 Marks) such as log book, weeklyreport, monthly reports, final training report including review of some critical/special experiences student has undergone (and mentioned in his report) at industry.

5. SUGGESTIVE WORK LOAD

Load of guiding and monitoring project in workshop/ industry per week per batch:

- Placing the students in training.
- Checking weekly report for individual students and evaluating on weekly basis.
- Continuous monitoring of each assigned students throughout the training duration.
- Visit industry/ follow up the students at training at least once in a month for evaluating student's activity and their progress.
- Conductthe presentation at least once in a month at their college per batch for evaluating student's activity and their progress.

Note: Total 28 hrs load per week per batch may be considered. Institute has to prepare time table for the facultyin such a manner that the concerned faculty remain free for one day (may be different days for different faculty) in each week for industrial visits and conducting the presentation at their parent college.

6. Guidelines for the Project in industry/college of diploma Power electronics engineering:

- Eligibility: As per GTU detention norms. Student can be sent for project in industry or at their parent college subject to eligibility.
- Students can do a project with following elective.
    1. In Private/government companies/industries.
    2. In Parent College.

Role of Department:

- Students can free to select project work with given above elective. Depending on the selection, department have to facilitate the student by providing project work environment.
- Department have to send training request letter to various industries well in advance before commencement of training.
- After getting sufficient number of seats from the industries/companies, students will be placed in different industries/ companies for their 6th semester project.
- The students are required to fill out the training form (Form-1), which is attached herewith.
- Department will issue an order letter to industries / companies for the said training mentioning the name and registration number of students.
- Normally, students are placed in industries/service centers of their choice. However, in case of high demand for a particular industry, students will be allocated a place based on their relative merit base on previous semester, punctuality in classroom in pervious semester and particular industry/company related practical knowledge.
- The department head will maintain a follow-up schedule for project during the semester period and assign faculty members to visit various industries/ parent college workshop where students are doing project work accordingly.
- During the monthly visits to industries/companies/college workshop, the faculty members will assess the progress of the students in their training, including attendance, discipline, and preparation of project reports.
- The department will schedule monthly visits for the students to the institute and assess their project work progress based on their presentations.
- The department is responsible for maintaining records of the continuous assessments conducted in monthly bases in both ways by means of teachers to industries and students to the institute.
- At the end of the semester assigned faculty member will assess the work done by student based on his presentation at the institute and project report.

Role of Industry

- Industry will give effective project cum training to the students in all sections/departments for improving their practical skills.
- The industry is expected to assign a group of students under project cum training to a middle management level person for supervision and guidance, known as the Training incharge.

- Training in-charge has to check monthly report (To certify the work done by students)with appropriate remarks.
- Industry may allot project to individual or group of students under training andstudents has to prepare report on the same project.
- Training in-charges are requested to guide students for preparing their project report.
- Industry is expected to maintain attendance for the student under training and informany irregularity of the students to their parent college.
- The industry is also expected to provide a certificate on their letterhead, stating that the student has completed the project work cum training and including any comments for the student's record and motivation.

7. GUIDELINE FOR STUDENTS

- Students would interact with the identified faculty of the department to suggest his choices for suitable industry or they can select to do the project work in their parent college.
- Students have to fill the form-2, which is attached here with, duly sealed and signed by authorities along with order letter and submit it to training officer in the industry on the first day of training cum project work. (attached here with form-2)
- Student would carry with him/her the Identity card issued by institute during semester period.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the industry. Student is expected to follow these rules, regulations, procedures etc obediently.
- During the training period students has to keep record of all the useful information in Log book and maintain weekly reports. (Attached here with form-3).
- He/she has to prepare a detailed report and presentations for each monthly visit to institute.
- Prepare final report about the whole training for submitting to the department at the time of final presentation and viva.
- Students can do a project cum Industrial training with following elective in privet or govt. industry/company/Parent College.

Sr. No	Category	Project work cum industrial training specific criteria.
1.	Core Power Electronics	Design, operation ,maintenance and troubleshooting of DC/AC Motor Drives
2.	Core Power Electronics	Design, operation, maintenance and troubleshooting of power electronic converters.
3.	Core Power Electronics	Design, operation ,maintenance and troubleshooting of Inverter and/or UPS
4.	Core Power Electronics	Operating maintaining and troubleshooting of Battery Electric vehicle and hybrid electric Vehicle.
5.	Core Power Electronics	Maintain and troubleshooting the Electric traction
6.	Core Power Electronics	Design and troubleshooting of Triggering circuits.

7.	Electrical	Operating, Maintaining and troubleshooting of electrical motors.
8.	Electrical	Operating, Maintaining and troubleshooting of Transformers.
9.	Electrical	Energy audit and commissioning.
10.	Renewable energy	Operating, Maintaining and troubleshooting of Solar power system, wind power system and hybrid power system.
11.	Electronics	Design and troubleshooting of Digital Electronics
12.	Electronics	Design ,Testing and troubleshooting of Consumer electronics
13.	Electronics	Analog and Linear Electronic Circuits
14.	Electronics	Sensors and actuators (Transducers)
15.	Electronics	Design IOT circuits
16.	Electronics	Microcontroller Application Development
17.	Electronics	Operating, Maintaining and troubleshooting of Consumer Electronics circuits.
18.	Electronics	Renewable Energies & Emerging Trends in Electronics
19.	Electrical and Electronics	Electrical and Electronic Measurements & Instruments
20.	Electrical and Electronics	Research in Production of wires and cables.
21.	Control system	Operate and maintain Closed loop control of Drives
22.	Control system	Operate and maintain Automation circuits
23.	Control system	Operating, Maintaining and troubleshooting PLC circuits
24.	Diversified Application	Operating, Maintaining and troubleshooting Robotics circuits
25.	Programming & Software Practices	MATLAB
26.	Programming & Software Practices	PSIM
27.	Programming & Software Practices	MultiSim
28.	Programming & Software Practices	Hardware Programming In C /python with Arduino/ESP/ raspberry and other microcontroller

- ✓ **If the students are undergoing training as a project work at an industry/ company, then the following sections/points should be incorporated throughout the entirety of their training period.**
  - Ensuring safety is of utmost importance in all production and testing units and it is crucial to educate students on the safety protocols and guidelines implemented within the unit. As part of the training, students should be taught about the appropriate use of personal protective equipment, handling of hazardous materials, and emergency response procedures.
  - To equip students with practical knowledge, the training cum project work should encompass the diverse manufacturing processes involved in production, such asassembly,

wiring, troubleshooting, maintaining, repairing and testing. To ensure that thefinal product meets the required standards, the training program should incorporate topics such as inspection procedures, quality checking and problem-solving techniques.

- To ensure that manufacturing machinery and equipment are being used correctly and maintained properly, the training program should provide instruction on their proper operation and maintenance. This includes training on how to use specific tools, instruments machinery, and software required to perform various manufacturing tasks.
- Understanding of safety procedures and regulations, including proper use of personal protective equipment (PPE) and hazard identification
- Communication skills for effectively communicating.
- Time management and organization skills for efficient handling of a large number ofclaims and inspections.
- Familiarity with computer software and tools used industry.

8. Guidelines for project report.

- The training report may contain
  - ✓ Title page
  - ✓ Certificate
  - ✓ Abstract
  - ✓ Acknowledgement
  - ✓ Index
  - ✓ Introduction of industry/company
  - ✓ Industry/ company lay out
  - ✓ Types of major equipments/instruments/machines used in industry with their specification, approximate cost and specific use.
  - ✓ Particulars of Practical Experiences in industry/workshop: testing/commissioning/Assembly/installation/Testing/troubleshooting of power electronics/electrical/electronics circuits and machines, Faults and remedies of devices and circuits.
  - ✓ Special/challenging experiences encountered during training if any.
  - ✓ My liking & disliking of work places-
  - ✓ References
  - ✓ Bibliography
  - ✓ It is mandatory for students to maintain and fulfill criteria for attendanceframed by Gujarat Technological University for the term to be granted.

9. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs. More could be added to fulfil the development of this course competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Practice environmentally friendly methods and processes. (Environment related)

The ADOs are best developed through the field based exercises/project work. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of each activity. They should also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Charts can be prepared.
b) Small report on any topic given by concern faculty.
c) Small groups of students can be formed for assigned work. Assigned work should be such that it covers market survey, team work, presentation, time management, quality development.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4*** means different types of teaching methods that are to be employedby teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide students on how to address issues on environment and sustainability.

12. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1.	Power Electronics	M Singh, K Khanchandani	ISBN 978-0070583894
2.	Power Electronics	Bimbhra P. S.	ISBN: 9788195123124
3.	Power Electronics	Umanand L.	ISBN: 9788126519453
4.	Power Electronics	Mohan Ned	ISBN: 9780471226932
5.	Power Electronics	Rashid Muhammad.	ISBN: 9788131702468

6.	Power Electronics and Motor Control	Shepherd W	ISBN: 9788175960381

13. SOFTWARE/LEARNING WEBSITES

a) https://www.vlab.co.in
b) https://nptel.ac.in
c) https://www.classcentral.com
d) https://swayam.gov.in/
e) https://shodhganga.inflibnet.ac.in/
f) https://onlinecourses.nptel.ac.in/

14. PO-COMPETENCY-CO MAPPING

Semester V	Project (Course Code: 4362401)						
	POs and PSOs						
Competency & Course Outcomes	**PO 1 Basic & Discipline specific knowledge**	**PO 2 Problem Analysis**	**PO 3 Design/ development of solutions**	**PO 4 Engineering Tools, Experimentation &Testing**	**PO 5 Engineering practices for society, sustainability & environment**	**PO 6 Project Management**	**PO 7 Life-long learning**
Competency	**Successfully plan and execute assigned work while adhering to safety standards and following industry standard procedures, as a team member/individual in Industry and/ or workshop with professionalism and a commitment to lifelong learning.**						
• Successfully plan and execute assigned workwhile adhering to safety standards and following industry standard procedures, as a team member/individual in Industry.	3	3	2	3	2	3	3
• Foster professionalism and a commitment to lifelonglearning	1	1	1		3	3	3
• Outline all the details of the work that has beenassigned to him or her.	3	3	2	3	2	2	2
• Gather and maintain all necessary materials, including work, data, tools,M/Cs, and other requirements, on schedule.	3	2	1	3	1	2	2
• Execute the assigned work safely and in accordance with established procedures, either as an individual or as part of a team.	3	2	1	2	1	3	2
• Utilize the latest industrial machinery and equipment, along with appropriate tools, measuring instruments, testing, and maintenance equipment.	3	1	1	3	1	2	2
• Consistently maintain work records and deliver aproject report based on work experience via verbaland written means of communication.	2					3	2

• Work on developing soft skills such as teamwork andcollaboration, leadership, time management, workingoutside of one's comfort zone, adaptability, flexibility, presentation, and analytical ability.	2					3	2
• Follow and uphold the waste management procedures implemented by the industry to safeguard the environment.	2				3	1	2
• Develop technical skill such as designing, testing, maintaining and troubleshooting of various power electronic circuits and soft skill such as sales and marketing and supply management.	2					3	2

Legend: '**3'** for high, '**2**' for medium, **'1'** for low and **'-'** for no correlation of each CO withPO.

15. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU BOS and Branch coordinator Persons

Sr. No.	Name and Designation	Institute	Contact No.	Email
1.	Mr. Vinod N. Makwana Lecturer – Power Electronics Department	Dr. S. & S. S. Ghandhy college of engineering & Technology, Surat	9427386784	vinodmakwana1@rediffmail.com
2.	Mr. Shailesh Dhoriyani, Lecturer – Power Electronics Department	Dr. S. & S. S. Ghandhy college of engineering & Technology, Surat	9913776990	shailesh.dhoriyani@gmail.com

FORM-1

તારીખ –

નામ:-
એનરોલમેન્ટ નંબર:-
મોબાઇલ નંબર-
ડિપ્લોમા પાવર
ઇલેક્ટ્રોનિક્સ.
સરનામું:

પ્રતી
ખાતાના વડાશ્રી
વિષય – પ્રોજેક્ટ (ઇન્ડસ્ટ્રીયલ ટ્રેનિંગ) માટે સ્થળની પસંદગી અને બાહેંધારી
પસંદ કરેલ તાલીમ સ્થળ નું નામ-
૧)
૨)
૩)
બાહેંધારી –
જી.ટી.યુ. ના નિયમાનુસાર હું પ્રોજેક્ટ (ઇન્ડસ્ટ્રીયલ ટ્રેનિંગ) માં જવા માટેની પૂર્વ જરૂરિયાત પૂરી ન કરી શકું તો હું નિયમ મુજબ પ્રોજેક્ટ (ઇન્ડસ્ટ્રીયલ ટ્રેનિંગ) ચાલુ રાખવા પાત્ર ઠરીશ નહીં અને આવા સંજોગોમાં પ્રોજેક્ટ ઇન્ડસ્ટ્રીયલ ટ્રેનિંગ છોડી દેવાની બાહેંધારી આપુ છું.

વાલી ની સહી **વિધાર્થી ની સહી**

FORM-2

FROM:_____

_____

_____

The Principal

_____

_____

Subject: Joining report of _____

As per your letter No.
_____Dated_____

I have reported for training at

_____

On_____. The weekly off day of the industry is _____

Thanking you

Yours faithfully

( )

Signature and Stamp of Officer in-charge

(To be send immediately after joining the industry)

FORM - 3

GUJARAT TECHNOLOGICAL UNIVERSITY

(NAME OF THE INSTITUTE)

POWER ELECTRONICS ENGINEERING DEPARTMENT

TRAINEES WEEKLY REPORT

Trainee Name:-

Name of Organization:-

Enrollment No:-

Week commencing from date_____to date _____

Day & Date	Abstract of Work done (Details of work with details of Project/training)	Remarks of Training supervisor (If any)

Sign of student with date

Assessment of this week:

An assessment criterion for assessing a student's project/industrial training: Professionalism and work ethics, Technical Skills, Communication Skills, Initiative and responsibility. Weekly reports must be submitted with final project report.

	Excellent	**Very good**	**Good**	**Satisfactory**	**Needs improvement**
Controlling Officer of Industry/faculty					
Institute Faculty					

Sign of Faculty (at the time of visit) **Sign of controlling officer of Industry**

FORM-4

Monthly Inspection & Interactions Report

(Duration: to)

The teacher should visit the industry/workshop once a month and after interactions with student and industry, he should provide a feedback report.

1. **Name & No of student.....**
2. **Sign of student.....**
3. **Name of industry /college.....**

Sr.No.	Incidents/Activities observed	Maximum Marks	Marks Obtained	Comments on performance
1.	Work performed in the duration (as per Log Book & Weekly Report) Teacher should sign logbook and weekly report on this occasion.	30		
2.	Interaction with student about work performed by him	20		

Overall Comments:_____

Name of industry Supervisors/Engineers/Managers with whom interacted:

Comment if any (Based on interaction with industry supervisor)_____

_____

_____

Advice to student if any:

_____

_____

Sign of Faculty

FORM-5

Evaluation Record of Monthly Presentation at Institute

Sr. No.	Name	Enrollment Number	Date of presentation	Marks obtained in each presentation (out of 50)	Total (Max Marks 150)
1.					
2.					
3.					
4.					
5.					
6.					

Sign of Faculty

(NAME OF THE INSTITUTE)

POWER ELECTRONICS ENGINEERING DEPARTMENT

Course Title: PROJECT(4362401)

Evaluation of External Examiner

Sr. No	Name of the student	Enrollment no.	External Presentation/ viva - (Maximum 200 Marks)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

External Examiner

(NAME OF THE INSTITUTE)

POWER ELECTRONICS ENGINEERING DEPARTMENT

Course Title: PROJECT(4362401)

Evaluation of Internal Examiner

SR.NO.	NAME OF THESTUDENT	ENROLLMENT NO.	Presentation with PPT / speak out (Max Marks-150)	Log Book, Weekly Report & Monthly Report (Max Marks-150)	Final Project/training report (Max Marks-100)	Internal viva Max(Mark 100)	TOTAL (Max Marks500)
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							

Internal Examiner