AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

DEPARTMENT: MECHANICAL ENGINEERING

COURSE PLAN AND INFORMATION SHEET

PROJECT BASED LEARNING (CAY: 2020 - 2021), Mode of Conduction: Online Mode

COURSE SUMMARY

Subject:	**PBL**		**Division:**		**H**
Class/Sem.	FE/II		**Syllabus Pattern:**		**2019 PAT**
Course Code:	110013		**Credits:**		**02**
Teaching Scheme			**University Examination Scheme**		
Theory	**Practical**	**Tutorial**	**Theory**		**Laboratory**
(hrs./week)	(hrs./week)	(hrs./week)	INSEM	ENSEM	Term Work
---	01 hrs.	----	--	50	25

Direct Assessment Methodologies

Sr. No.	Assessment methods	Marks/Weightage	Assessment
1	Weekly Assessment	50	Internal
2	Mock End-semester Exam	---	---
3	In-semester Exam	---	---
4	End-semester Exam	50	External
5	Term-work	25	External

Direct Attainment Rubrics for Course Outcomes (COs):

First Year evaluated the attainment of course based on the following rubrics,

Attainment levels:

Attainment Level 1: If Class Average >=50% and <52.5% in the respective examinations

Attainment Level 2: If Class Average >=52.5% and <55% in the respective examinations

Attainment Level 3: If Class Average >=55 in the respective examinations

CO Attainment Calculations:

The CO Attainment for internal and external assessment is calculated by taking an average of attainment level obtained by respective assessment tools in the internal and external assessment. The final CO attainment is calculated as:

Course Outcome (CO) attainment = 20% of average Internal Assessment + 80% of average external assessment

Savitribai Phule Pune University

Faculty of Science & Technology

Revised Structure

For

First Year

Bachelor of Engineering

(Choice Based Credit System)

(2019 Course)

(With Effect from Academic Year 2019-20)

TABLE -1 First Engineering _Structure for Semester-I

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credits			
		Theory	Practical	Tutorial	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
107001	Engineering Mathematics-I	03	--	01	30	70	25	--	--	125	03	--	01	04
107002/ 107009	Engineering Physics / Engineering Chemistry	04	02	--	30	70	--	25	--	125	04	01	--	05
102003	Systems in Mechanical Engineering	03	02	--	30	70	--	25	--	125	03	01	--	04
103004 / 104010	Basic Electrical Engineering / Basic Electronics Engineering	03	02	--	30	70	--	25	--	125	03	01	--	04
110005/ 101011	Programming and Problem Solving / Engineering Mechanics	03	02	--	30	70	--	25	--	125	03	01	--	04
111006	Workshop[α]	--	02	--	--	--	--	25	--	25	--	01	--	01
	Total	16	10	01	150	350	25	125	--	650	16	05	01	22
101007	Audit Course 1[&]	02	Environmental Studies-I											

Induction Program : 2 weeks at the beginning of semester-I and 1 week at the beginning of semester-II

TABLE -2 First Engineering_ Structure for Semester-II

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credits			
		Theory	Practical	Tutorial	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
107008	Engineering Mathematics-II	04	--	01	30	70	25	--	--	125	04	--	01	05
107002/ 107009	Engineering Physics/ Engineering Chemistry	04	02	--	30	70	--	25	--	125	04	01	--	05
103004 / 104010	Basic Electrical Engineering / Basic Electronics Engineering	03	02	--	30	70	--	25	--	125	03	01	--	04
110005/ 101011	Programming and Problem Solving / Engineering Mechanics	03	02	--	30	70	--	25	--	125	03	01	--	04
102012	Engineering Graphics[Ω]	01	02	01	--	50	25		--	75	01	01		02
110013	Project Based Learning[§]	--	04	--	--	--	25	50	--	75	--	02	--	02
	Total	15	12	02	120	330	75	125	-	650	15	05	02	22
101014	Audit Course 2[&]	02	Environmental Studies-II											
107015		--	Physical Education-Exercise and Field Activities											

year session.)

110013: Project Based Learning		
Teaching Scheme: **PR: 04 Hrs/Week**	**Credits** **02**	**Examination Scheme:** **PR : 50 Marks**

Preamble:

For better learning experience, along with traditional classroom teaching and laboratory learning; project based learning has been introduced with an objective to motivate students to learn by working in group cooperatively to solve a problem.

Project-based learning (PBL) is a student-centric pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge, or problem. It is a style of active learning and inquiry-based learning. (Reference: Wikipedia). Problem based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development.

Course Objectives:

1. To emphasizes learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes:

CO1: Project based learning will increase their capacity and learning through shared cognition.
CO2: Students able to draw on lessons from several disciplines and apply them in practical way.
CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame.

A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be **exemplary**. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

- A few hands-on activities that may or may not be multidisciplinary
- Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize and present their learning.
- Activities may include- Solving real life problem, investigation /study and Writing reports of in depth study, field work.

Assessment:

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness.

Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities.

Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.

Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

- Individual assessment for each student (Understanding individual capacity, role and involvement in the project)
- Group assessment (roles defined, distribution of work, intra-team communication and togetherness)
- Documentation and presentation

Evaluation and Continuous Assessment:

It is recommended that the all activities are to be record and regularly, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes.

Recommended parameters for assessment, evaluation and weightage:

- Idea Inception **(5%)**
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product **(50%)** (Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) **(25%)**
- Demonstration (Presentation, User Interface, Usability etc) **(10%)**
- Contest Participation/ publication **(5%)**
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects **(5%)**

PBL workbook will serve the purpose and facilitate the job of students. mentorand project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

References:

- Project-Based Learning, Edutopia, March 14, 2016.
- What is PBL? Buck Institute for Education.
- www.schoology.com
- www.wikipedia.org
- www.howstuffworks.com

FINALISATION OF PBL GROUPS AND TOPICS

AY :2020-21 **PBL ACTIVITY** **F.E. COMMON**

GROU	RN-LE	NAME OF LEADER	GROUP MEMBER1	GROUP MEMBER2	GROUP MEMBER3	GROUP MEMBER4	TOPIC OF PBL ACTIVITY
A11	101	ABHALE JYOTI JALINDAR	102-ABHANG SHUBHAM DILIP	103-DESHMUKH ABHAY ANIL	104-ATHARE ABHISHEK LAXMAN	105-ACHARYA ATHARVA SANJAY	PROJECT ON "WATER MANAGEMENT TECHNIQUES"
A12	109	Ahire Sanket Dagadu	106- Adhav Akshay Kailas	107- Aher Dipak Bhausaheb	108- Aher Vaishnavi Dilip	110- Amale Sudarshan Shivaji	Covid-Robo
A14	116	Tushar Argade B.	117 Arote Rushikesh Suresh.	118 Athare Rutuja J.	119 Athawale Namarata V.	120 Avhad Kanchan S.	Global Warming
A13	111	Ambre Utkarsha Ramesh	112- Andhale Gaurav Raghunath	113- Andhale sanket	114- Andhale Sushant	115- Argade Sanchit	Hospital management system
A21	121	121-Avhad Rakesh vasant	122-Avhad rushikesh dilip	123-Avhad sanika vijay	124--Avhad vaishanavi govind	125- Avhad vaishanavi jagannath	Rainwater harvesting
A22	126	Vivek Manik Avhad	127- Avhad Vrushali Namdev	128 -Shrijit Ramrao Badakh	129 - Bagul Mansi Sanjay	130- Amisha Dnyaneshwar Bambale	"SOLAR POWER & ITS SCENARIO IN MAHARASHTRA"
A23	131	Anurag Balasaheb Bambale	132Bankar Hindavi N.	133 Bansode A. R.	134 Barguje Vedant K.	135.Barkade Urmila U.	Sun Tracking Solar Panel.
A24	136	Barve Madhura Gajanan	137-Barve Sagar Dnyaneshwar	138 Baviskar Anjali Yuvaraj	139 Bendre Nikita kishor	140 Bhagat Shivam Tukaram	Water conservation
A31	146	Bharade Sharvari Santosh	147-Bharti Gauri Sunil	148-Bhaskar Rutuja Sanjay	150-Bhise Vaibhav Ramesh	149-Ketan Rajendra Bawar	142-Akash Sunil Bhalerao
A32	141	141-Bhalekar Pratiksha D	143-Bhalerao Priti Gokul	145-Shital Bhaskar Bhanage	152-Gayatri Satish Bhoknal		
A33	156	Harshal Avinash Bibave	155-Sarthak Balasaheb Bhorka	144-Rutuja Ananad Bhalerao	154-Pratiksha Dhananjay Bhor	151-Vaibhav Rajendra Bokare	157-Shreyash Jagannath Bidave
B11	205	Shubham Satish Bulkund	201-Shrikant Bidve	202-Abhishek Bihani	203-Tejas Borkar	204-Kanishka Borole	Electronic covid shield
B12	206	Chakor Harshal Ashok	207 Channa Bhakti Vinod	208 Chaskar Rushikesh Sanjay	209 Chaudhari Gaurav Bhima	Chaudhari Kundan Kiran	AUTOMATIC STREET LIGHT USING LDR .
B13	214	SHRIRAJ INDRABHAN C	211 - Pranjal Chaudhari	212 - Sahil Chaudhari	213 - Sakshi Chaudhari	215 - Yogesh Chaudhari	Working Principal Of Solar Grass Cutter
B14	217	Chhajed Harsh Sunil	216- CHAURE UJJWAL BAPU	218- CHINDHE DNYANESHWARI	219- CHINDHE RUTURAJ ANIL	220- CHOUDHARI VAIBHAVI D	PID Controller
B21	223	Dangat Sujay Ramesh	221-Dagale Dipali Chandrakant	222- Dahatonde Suraj Yashwant	224- Dange Shubham Sakharam	225- Dani Tanmay Dinesh	Auto obstacle detector via shoes and hand gloves for
B22	227	Daware Sakshi Valu	226 Sayli Datir	228 Dengale Punam	229 Deore Prajkta	230 Desale Dhiraj	Combine harvester with sunflower header
B23	235	Prachi Deshmukh	231- Amishwar Deshmukh	232- Ankita Deshmukh	233- Aarshin Deshmukh	234- Manthan Deshmukh	Railway Track Crack Detection
B24	236	Ruchita Deshmukh	237- Rupesh Deshmukh	238- Rutuja Deshmukh	239- Shreeraj Deshmukh	240- Vishwa Deshmukh	Traffic analysis and signal design
B31	146	Bharade Sharvari Santosh	147-Bharti Gauri Sunil	148-Bhaskar Rutuja Sanjay	150-Bhise Vaibhav Ramesh	149-Ketan Rajendra Bawar	142-Akash Sunil Bhalerao
B32	141	141-Bhalekar Pratiksha D	143-Bhalerao Priti Gokul	145-Shital Bhaskar Bhanage	152-Gayatri Satish Bhoknal		
B33	156	Harshal Avinash Bibave	155-Sarthak Balasaheb Bhorka	144-Rutuja Ananad Bhalerao	154-Pratiksha Dhananjay Bhor	151-Vaibhav Rajendra Bokare	157-Shreyash Jagannath Bidave
C11	309	Tejas Manoj Divate	335 Ritesh Gaikwad	316 Sanket Dongare	308 Suyog Dighe	306 Rohit dighe	318 dube samarth
C12	312	Dond Rajashri Sudam	317-Dongare Akshita vilas	304-Dighe Kirti Ashok	324-Gadakh Ashvini chandrasek	340-Galange Tanvi Somnath	303 Dighe disha
C13	326	Gade onkar popat	325- Gadakh Mayur Sopan	301-Dighe Abhishek Nandu	328-Gadge Bipin Sunil		

C14	327	Shreya Sudhir Gadekar	311- Rutuja Dokhe	314- Sakshi Dongare	323- Shruti Ende	310- Pravin Dolfode	329 om gadhave
C21	333	Gaikwad Nikhil	322 - Pravin Ekhande	336 - Sahil Gaikwad	338 - Vaibhav Gaikwad	339 - Prakash Gajare	320 dushing siddharth bapusaheb
C22	334	Gaikwad Nikita Uddhav	331-Abhishek Gagare	332-Akansha Gaikwad	305-Mahesh Dighe	307- Shrutika Dighe	
C23	330	varad shailesh gadkari	313 anket tanaji dongare	302 akshay adinath dighe	shubhsm gaikwad 337	315 samadhan donare	dube siddhant 319
C31	343	Gavhane Vijaya Lahanu	341-Ganjave Prajwal Babasaheb	342-Gavale Yash Vijay	345-Gawale Gaurav Tukaram	321-Ekhande Akanksha Suryabhan	Smoke Absorber And Energy Generation
C32	348	Ghare Pramod Rajendra	346- Gawali Shubham Gajanan	347-Ghandat Dhiraj Machhindra	349 Ghare Sanket Sanjay	350 Ghodke Aaditya Aabasaheb	Resistance velding
C33	351	Gholap Nikita Rajendra	352-Ghole Bhushan Sahebrao	353-Ghuge Vaishali Namdev	354-Ghuge Varsha Ganapat	355-Ghuge vishal Ashok	Smart Traffic signals
C34	357	Ghuge Vrushali Arun	356- Ghuge Vitthal Anil	358- Ghule Anisha Bhausaheb	--	--	Solar Refrigeration System
D11	402	GIRASE VISHWARAJ SINGH	401 GHOMARE SANKET RAJENDRA	403 GIRI ARPITA RAJENDRA	404 GIRI OM BHARAT	410 GORDE AARUSHI RAVINDRA	Traffic flow control using Dynamic traffic light
D12	406	GITE KUSHIKESH BABASAHEB	405 GITE ARUNDHATI SACHIN	407 GOPALE BHUSHAN VILAS	408 GOPALE SAKSHI SANTOSH	409 GOKANI HENUKA DATTATRAY	Air Pollution monitor
D13	414	GORLE GANESH SANJAY	411 GORDE ADITYA RAOSAHEB	412 GORDE SNEHAL DILIP	413 GORE ROHAN BABAN	415 GUJAVI VEDANT SAMBHAJI	Tidal energy resourses & its extractionb
D14	419	GUNJAL AKASH DATTATRAY	418 GUJARATHI MAHESH SATISH	417 GUMASTE SHREYA SACHIN	418 GUNDE ABHISHEK SHASHIKANT	420 GUNJAL ANUSHKA TUKARAM	Dual axis solar tracking system
D21	421	GUNJAL JAYSHREE BALASAHEB	422 GUNJAL KALYANI LAXMAN	423 GUNJAL KALYANI SOMNATH	424 GUNJAL MONIKA SANDIP	425 GUNJAL OM SHASHIKANT	An investigation into consumer preparation of refills and refillable packaging
D22	427	GUNJAL KUSHIKESH DATTATRAY	426 GUNJAL RITESH RAMESH	428 GUNJAL SATYAJIT SAKHAHARI	429 GUNJAL SHUBHANGI DINKAR	430 GUNJAL SUYASH AJAY	Design & Fabrication of automatic floor cleaner
D23	434	HARISHCHANDRE SHREYAS	431 GUNJAL TEJAS ANIL	432 GUNJAL VISHAL ASHOK	433 HARDE AKSHADA BALASAHEB	435 HASE ADITYA BALASAHEB	Use of ultrasonic sensor for object sensing & Automatic Disacceleration and breaking car
D24	438	HASE SURAJ DNYANDEV	436 HASE PALLAVI MARUTI	437 HASE RUTUJA SUNIL	439 HASE TEJASHRI ANNASAHEB	440 HASE VAISHNAVI BHAUSAHEB	Photovoltic Power Plant
D31	443	HINGMIRE SHUBHAM NITIN	441 HASE VIJAYA BHAUSAHEB	442 HASE YUVRAJ PRAKASH	444 HURE OM BHASKAR	445 INAMDAR NAVED ZAKIRHUSSAIN	Secure Vaccine distributions
D32	446	INGALE PRASAD JAGANNATH	447 JADHAV ABHAY KAILAS	448 JADHAV ANUJA SONU	449 JADHAV KALYANI KISHOR	450 JADHAV MAHESH JANARDHAN	Design & Development of fire gun
D33	454	JAGTAP PRITESH VIKAS	451 JADHAV SAKSHI SHIVAJI	452 JADHAV SNEHA VITTHALRAO	453 JADHAV VAIBHAV ANIL	455 JAKHAD EKTA SUBHASH	Off road & wind tunnel aerodynamic study of human powered vehicles
D34	458	JATAR SHUBHAM MAHENDRA	456 JAMBUKAR PRATIK SANJAY	457 JAMBADE SIDDHI AMBADAS			Railway track crack detection
E11	501	Jaybhaye Abhishek	502- Jedhgule Samadhan	503- Jejurkar Nikhil	504- Jondhale Nikita	505- Jondhale Pratik	Fire alarm / detector with arduion
E12	509	Kadlag Krishna	506- Jorvekar Ishwari	507- Joshi Abhishek	508- Jashi shailesh	510- Kadam Gaurav	Stylus Pen
E13	515	Kadlag Purushottam	511- Kadam Shivanjali	512- Kadhane Sakshi	513- Kadlag Aniket	514- Kadlag Nachiket	Smart Cities Mission
E14	516	Kadu Kamlesh	517- Kakad Gauri	518- Kakad Tushar	519- Kale Rutuja	520- Kale Sagar	Automatic plant watering system
E21	524	Kambale Tejas	521- Kale Shubhangi	522- Kale Tejas	523- Kale Vaishnavi	525- Kambale Om	Laser security system
E22	527	Kanawade Mahesh	526- Kanawade Akshada	528- Kanawade Priyal	529- Kanawade Ravindra	530- Kanawade Shweta	Bio-medical waste management during covid 19
E23	533	Kangane Machhindranath	531- Kandalkar Akash	532- Kandekar Mahesh	534- Kangane Sarita	535- Kank Vaibhav	Automated Water Alarm System
E24	538	Karad Viren	537- Kapadi Omkar	539- Karle Vaibhav	540- Karvar Pradip	547- Khairnar Gayatri	Water level Indicator

F11	606	Kolhe Vithhal Narayan	644-Mahale Yogesh Dattatray(644)	614-Kulange Shubham Lahanu	625-Lahamage Darshan	607-Koli Yash	610-Kotkar Tushar Gulab
F12	611	Kshatriya Bhakti Kishor	602-Gayatri Badrinath Kokate	604-Pranali Nanasaheb Kolhe	613-Pratiksha Madhukar Kuldharan	617-Aditi Mukund Kulkarni	
F13	626	Lahare Siddhi	613-Kshirsagar Shraddha Rohidas	627-Landge Aditi Sandip	647-Malunjkar Gauri Ramesh	648-Malunjkar Rajnandini Nanasaheb	650-Mandlik Tanushree Navnath
F21	632	Ledange Sunas Ramchandra	633-Akash Lende	640-Vijay Lonkar	643-Sushant Mahale	649-Prathmesh Mandlik	
F22	624	Labade Shrikant Nandkumar	601-Pritesh kokane	623-Shubham kute	629-Abhay Lawande	630-Akash Lawande	631-Suyog Lawande
F23	655	Memane Abhishek Prabhakar	654-Mehetre Omkar Somnath	653-MatkarBhushanPrakash	637-LondheAbhayDattatray	628-LandgeSaurabhDaulat	656-MengalRohitDattatray
F31	641	Madane Dyaneshwari somnath	616-Aaishwarya Kulkarni	639-Shital Lonkar	642-Punam Mahaddev	657-Mhase Manasi	658-Mhaske Swamini
F32	609	Kothawar Gokul Rangnath	634-Chaitanya Lende	621-Kunte Niranjan	620-Kumar Uddeshya	635-Abhi Loharkar	
F33	645	Omm. Malekar	619-PRIYA KULKARI	622-POOJA KUTE	622-ADITI LONDHE	652-KAUSTUBH MANTRI	608-EKTA KORDE
G11	705	More Sanket Goraksh	701- Minde Swati Tanaji	702- Misal Gorakshanath Ashok	703- Mokal Vaibhav Anil	704- Dhruv More	Electronic finger voting system
G12	710	Murtadak Pranjal Babasaheb	707- Mungase Tanmay Prafull	708- Mungase Vaishnavi Prafull	709- Mungase Vishal Ashok	NA	Collect data on various types of bridges on Indian Railway.
G13	714	Naikwadi Yash Rajendra	711- Prathamesh Mutke	712- Shubham Nagre	713- Aishwarya Naik	715- Sanket Nanaware	Green building concept
G14	719	Navale Satwik Annasaheb	716-Narwade Aniruddha dagdu	718-Navale ankita annasaheb	720-Navathar aniket Abasaheb	717-Narhare Om Harishchandra	Restaurant Management system
G21	721	sidharth navgire	722- sanket navle	723- shubham navale	724- kirti nehe	725- rohit nehe	automatic hand sanitizer
G22	729	piyush newaskar	726- shubham nehe	727- tejas nehe	728- sakshee nerikar	730- kiran nikam	solar battery charger
G23	733	Nachiket Jayantkumar Nyati	731- Pratik Nirmal	732-Harshali Nithave	734-Gaurav pabale	735-Raj pabale	Multicore Calculator
G24	740	PANSARE OM BHAUSAHEB	736 - PAGARE SANIKA BHAUSAHEB	737 - PADAVE AKANSHA SATYAWAN	738 - PALVE PRATIK BABLU	739 - PALVE PRATIKSHA NIVRUTTI	SMART BLIND STICK (SBS)
G31	745	PATHAN SAIMEEN RIYAZ	PARDESHI NIKITA RAJESHSIHN	PANSARE TEJAS HARISHCHANDRA	PANSARE VAISHNAVI VIVEK	743 - PARDESHI KHUSHI RAJESH	Online OPD booking system
G32	748	Nikhil Patil	746- Amol Patil	747- Kartik patil	749- Rohit Patil	750- Rishikesh patil	Python Program for Number Guessing
G33	753	Monali Patkal	751-Rushikesh Patil	752- Sakshi Patil	754- Sidhhi Pavbake	755- Akshada Pawar	Water Logging
G34	758	Pawar Sakshi	757-Pawar Pushkar	756-Pawar Ashutosh			Artificial Intelligence with Augmented reality and Virtual Reality
H14	816	Rahane Sakshi Rajendra	817-Sanket Satish Rahane	818-Sradhha Ramdas Rahane	819-Shruti Sanjay Rahane	805-Perane Tejas Sarjerao	Water level Controller
H22	828	Raut Akash Rajendra	826 - Rathi Deepak Sunil	827 - Raut Aditya Revannath	829 - Raut Atharv Ketan	830 - Raut Mithilesh sameer	BMI calculating portal using python
H24	835	Sakhare Advait	836 - Sakalkale Mohit	838 - Salve Amit	839 - Sambhus Ritesh	840 - Sanap Hrushikesh	Solar Tracking Device
H32	846	Sangle Sanket Prabhakar	848- Sangle Sneha	849- Sarbande Akshay Digambar	850- Sarbande Kajal Bhausaheb		Rain Detector
H33	853	H 853 Shivam ganesh saskar	H 854 prajkta ajay satpute	H 851Ashish Sangameshwar sarkate	H 852laxmi lalubhau sarkote	H 855 shruti sanjay satpute	LPG leakage Detector
H34	856	Sayyad Akil Salim	857- Shaikh Arshan Anil	858-Shanu singh	833- Rokade Shubhangi Macchindra	846- Sangale Sakshi Vilas	1. Smart Dustbin
H21	821	Atharva Ashok Rahinj	822 Rajepawar D H	823 Ramkar Nishant	824 Rangeniwar Anmol	825 Rashmi kumari Awdesh Kumar	Desktop Assistant

H 31	841	Sanap mayur	842 sanap Prasen	843 Sangale Gaurav	844 Sangle Hrushikesh	845 Sangale Nita	Laser Light Securty Alarm
H23	831	Rode Arjun	832 Rodge Rohan	834 Sahane Nikhil	835 Saindane Ujwal		Privacy and Data Leak
I11	901	Shelke Om Ashok	902- Shelke Pallavi Tukaram	903- Shelke Pooja Dattatray	904- Shelke Pratiksha Gitaram.	905- Shelke Sarika Navnath	Electric ventilator for hospital use
I12	910	Shete Tejal Rajendra	906- Shembade Laxman M	907- Shepal Vaishnavi Minanath	908- Shete Gauri Jalindar	909- Shete Shubham Babasah	Energy conservation
I13	911	saiprasad siddeshwar	912- nilesh shidore	913- saurav shimpi	914- Abhishek shinde	915- deven shinde	blood donation mgt. system
I14	917	dyaneshwar shinde	916- dharmaraj shinde	918- gaurav shinde	919- harshada shinde	920- prasad shinde	Automatic Street Light using LDR
I21	921	rushikesh shinde	922- rutuja shinde	923- swaraj shinde	924- vaibhav shinde	925- vedant shinde	salse processing system
I22	926	siddhi shirole	927- aniket shirsat	928- amit sonawane	929- gayatri sonawane	930- shital sonawane	mobile charging using LDR
I23	931	shubham sonawane	932 vaibhav sonawane	933- vaishnavi sonawane	934- yashraj sonawane	935- aayush soren	automatic street light
I24	938	Tajane Chintan Ravindra	936 - Supekar Sagar Hanumant	937 - Suryavanshi Vishal Vijay	939 - Tajane Om Vinayak	940 - Tajane Siddhi Sujit	Innovative Vaccum cleaner
I31	942	Akanksha Rohidas Talele	940-Vaishnavi Dattatray Tajane	943-Ulkesh Suresh Talpade	944-Vikram Bhaskar Tambe	945-Aniket Babasaheb Tanpu	Automatic Hand Sanitizer Dispenser
I32	947	Tanpure sakshi santosh	950- pratik thitame	948- Mahesh Tawar	946- Om Tanpure	949- Sandesh Tayade	Automatic Street Light
I33	951	abhishek thite	952- abhishek thombal	953- onkar thombare	954- ashish thorat	955- rushikesh thorat	
I34	956	suraj thorat	957- vaibhav thorat	958- dnyaneshwari thosar			quiz game

Er. N. H. TAMBE
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AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

FE (COMMON)-2020-21 SEMESTER II

FACULTY ALLOCATION FOR PBL ACTIVITY

A	A1	A2	A3	B	B1	B2	B3
	RSG	RSG	RGD		ABA	ABA	RGD
C	C1	C2	C3	D	D1	D2	D3
	PSS	PSS	ASS		NTK	NTK	NTK
E	E1	E2	E3	F	F1	F2	F3
	GBJ	GBJ	NHT		RGD	RGD	RGD
G	G1	G2	G3	H	H1	H2	H3
	KSB	KSB	ASS		NHT	NHT	NHT
I	I1	I2	I3	J	J1	J2	J3
	KSB	KSB	KSB		ASS	ASS	ASS

N. H. Tambe PBL Coordinator	Prof. V. Y. Patil FE Coordinator

AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

FE (COMMON)-2020-2021 SEMESTER II

PROJECT BASED LEARNING (110013)

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02	E1, E2	Prof. G.B. Jambukar	Prof. R.S. Gavhane
03	B1, B2	Prof. A. B. Aher	Prof. P.S. shivsharan
04	C1, C2	Prof. P.S. shivsharan	Prof. A. B. Aher
05	D1, D2, D3	Prof. N. T. Kurhe	Prof. R. G. Dhamak
06	F1,F2, F3,	Prof. R. G. Dhamak	Prof. N. T. Kurhe
07	A3, B3	Prof. R. G. Dhamak	Prof. N. H. Tambe
08	G1,G2	Prof. K. S. Bhagwat	Prof. R. G. Dhamak
09	I1, I2, I3	Prof. K. S. Bhagwat	Prof. A. S. Shinde
10	H1, H2	Prof. N. H. Tambe	Prof. A. S. Shinde
11	H3, E3	Prof. N. H. Tambe	Prof. K. S. Bhagwat
12	J1, J2, J3,	Prof. A. S. Shinde	Prof. K. S. Bhagwat
13	C3, G3	Prof. A. S. Shinde	Prof. N. H. Tambe

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AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

FE (COMMON)-2020-2021 SEMESTER II

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			5	20	10	5	5	5	50
111	F190100019	Ambre Utkarsha Ramesh	4	18	8	4	4	4	42
112	F190100022	Andhale Gaurav R.	3	12	6	2	3	4	30
113	F190100023	Andhale Sanket Vilas	4	14	6	4	4	5	38
114	F190100024	Andhale Sushant Arun	3	10	6	4	4	4	28
115	F190100027	Argade Sanchit Gansh	4	16	8	4	4	4	40

R. S. Gavhane	G.B.Jambukar	N. H. Tambe	Prof. V. Y. Patil
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FE (COMMON)-2020-2021 SEMESTER II

PROJECT BASED LEARNING WORKBOOK (110013)

CONTINUOUS ASSESSMENT AND EVALUATION

TITLE OF PROJECT/PROBLEM:

DIV: E **BATCH: E1** **GROUP: E11**

Roll No.	Exam seat No.	Name of student	Idea Inception (5%)	Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (Individual assessment and team assessment) (50%)	Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) (25%)	Demonstration (Presentation, User Interface, Usability etc) (10%)	Contest Participation/ publication (5%)	Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (5%)	Total (100%)
			5	20	10	5	5	5	50
501		Jaybhaye Abhishek	4	18	8	4	3	4	41
502		Jedgule Samadhan	3	12	6	3	3	3	30
503		Jejurkar Nikhil	4	18	9	4	3	4	42
504		Jondhale Nikita	4	18	8	4	3	4	41
505		Jondhale Pratik	4	18	8	4	3	3	40

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PROJECT BASED LEARNING WORKBOOK (110013)

CONTINUOUS ASSESSMENT AND EVALUATION

TITLE OF PROJECT/PROBLEM:

DIV: C **BATCH: C1-C2** **GROUP: C11**

Roll No.	Exam seat No.	Name of student	Idea Inception(5%)	Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (Individual assessment and team assessment)(50%)	Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) (25%)	Demonstration (Presentation, User Interface, Usabilityetc) (10%)	Contest Participation/ publication (5%)	Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (5%)	Total(100%)
			5	20	10	5	5	5	50
309	F190100174	TejasDivate	4	17	8	5	4	4	42
335	F190100147	RiteshGaikwad	5	16	9	4	4	4	42
316	F190100155	SanketDongare	4	18	7	5	3	5	42
308	F190100147	SuyogDighe	3	17	9	5	3	5	42
306	F190100144	RohitDighe	4	18	7	5	4	4	42
318	F190100157	Samarth Dube	5	16	8	5	4	4	42

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AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

FE (COMMON)-2019-20 SEMESTER II

PROJECT BASED LEARNING WORKBOOK (110013)

CONTINUOUS ASSESSMENT AND EVALUATION

TITLE OF PROJECT/PROBLEM:

DIV:A BATCH: A1 GROUP: A3

Roll No.	Name of student	Week 1	Wee 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Total	Out of 25
		10	10	10	10	10	10	10	10	10	10	10	10	10		
111	Ambre Utkarsha Ramesh	8	9	8	9	8	8	9	8						67	21
112	Andhale Gaurav R,	7	6	7	5	7	7	7	5						46	15
113	Andhale Sanket Vilas	8	7	7	8	7	7	8	8						60	19
114	Andhale Sushant Arun	5	5	6	6	7	5	5	5						44	14
115	Argade Sanchit Gansh	8	8	7	8	8	8	8	8						62	20

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AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

FE (COMMON)-2020-21 SEMESTER II

PROJECT BASED LEARNING WORKBOOK (110013)

CONTINUOUS ASSESSMENT AND EVALUATION

TITLE OF PROJECT/PROBLEM: Mobile Charging Using Solar Bag

DIV: E **BATCH: E1** **GROUP: E11**

Roll No.	Name of student	Week 1	Wee 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Total	Out of 25
		10	10	10	10	10	10	10	10	10	10	10	10	10	80	
501	Jaybhaye Abhishek	8	8	9	9	9	9	9	9						70	22
502	Jedgule Samadhan	6	6	6	6	6	6	6	6						48	15
503	Jejurkar Nikhil	9	9	8	9	9	8	9	9						70	22
504	Jondhale Nikita	9	9	9	9	8	9	9	8						70	22
505	Jondhale Pratik	8	7	7	8	9	9	9	9						66	21

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Prof. V. Y. Patil
FE Coordinator

SAMPE REPORT.

Savitribai Phule Pune University, Pune 2019 Course

A Project Based Learning I Report

On

"-: SOLAR TRACKING DEVICE :-"

By

- Sakalkale Mohit Milind (836)
- Sakhare Advait Suhas (837)
- Salve Amit Sharad (838)
- Sambhus Ritesh Rajendra (839)
- Sanap Hrushikesh Dilip (840)

Under Guidance of
Mr. G. B. JAMBUKAR

First Year Engineering

Amrutvahini College of Engineering, Sangamner

(Academic Year: 2020-21)

FIRST YEAR ENGGINEARING

(Academic Year: 2020-21)

Amrutvahini College of Engineering,

Sangamner.

CERTIFICATE

This is to certify that the PBL I report on

"Title of PBL Project"

Has been successfully completed by: -

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- Sakhare Advait Suhas (837)
- Salve Amit Sharad (838)
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- Sanap Hrushikesh Dilip (840)

Students of first year, in partial fulfillment of requirement of Bachelor of Engineering from Amrutvahini College of Engineering during academic year 2020-21

Mr. G. B. Jambukar
PBL I Guide

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CERTIFICATE

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- Salve Amit Sharad (838)
- Sambhus Ritesh Rajendra (839)
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Student of First Year Engineering was examined in the PBL I

Work entitled

"Solar Tracking Device"

INTERNAL EXAMINER **EXTERNAL EXAMINER**
Place- Sangamner **Date- / /2021**

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Abstract:

Energy crisis is the most important issue in today's world. Conventional energy resources are not only limited but also the prime culprit for environmental pollution. Renewable energy resources are getting priorities in the whole world to lessen the dependency on conventional resources. Solar energy is rapidly gaining the focus as in important means of expanding renewable energy uses. The energy extracted from solar photovoltaic (PV) or solar thermal depends on solar insulation. For the extraction of maximum energy from the sun, simple tracking solar system using servo motors and light dependent sensors has been developed. A microcontroller is based designed based design technology of an automatic solar tracker is presented in this work. Sun trackers move the solar collector to follow the sun trajectories and keep the orientation of the solar collector at an optimal tilt angle.

In this work, two axis solar tracking has been implemented through microcontroller. This method is increasing power collection efficiency by developing a device that tracks the sun to keep the panel at a right angle to its rays.

Chapter 1: Introduction

Nowadays, climate change on globe is at a critical level. Global warming or climate changes can be seen through some of them natural phenomenon like the effect on crops and extreme weather conditions around the world. Renewable-energy is an energy which comes from natural resources such as sunlight, wind, rain, tides, and geothermal heat, which are renewable (naturally replenished). Solar energy is rapidly advancing as an important means of renewable energy resource in many applications like thermal energy storage systems and electric power generation systems. As the demand of electricity keeps increasing by years, solar energy is the alternative for those electricity problems. Solar energy is the energy derived from the sun through the form of solar radiation. The sun is the most inexhaustible, renewable source of energy known to man. Solar energy provides light, heat and energy to all living things. There is no price and also no air pollution created by solar energy, environmentally friendly and the solar energies are interminable supplies. By using solar arrays, a series of solar cells electrically connected, a DC voltage is generated which can be physically used on a load. Solar arrays or panels are being used increasingly as efficiencies reach higher levels, and are especially popular in remote areas where placement of electricity lines is not economically viable. The average solar energy intercepted by a fixed collector, during the whole day, is less than maximum attainable. This is due to the static

placement of the collector which limits their area of exposure to direct solar radiation. More energy can be extracted in a day, if the solar collector is installed on a tracker, with an actuator that follows the sun like a sunflower. Usually, the single-axis tracker follows the sun's east-west movement while two-axis tracker also follows the sun's altitude angle. If a flat solar panel is mounted on level ground, it is obvious that over the course of the day the sunlight will have an angle of incidence close to 90° in the morning and the evening. At such an angle, the light gathering ability of the cell is essentially zero, resulting in no output. As the day progresses to midday, the angle of incidence approaches 0°, causing a steady increase in power until at the point where the light incident on the panel is completely perpendicular, and maximum power is achieved. From this background, we see the need to maintain the maximum power output from the panel by maintaining an angle of incidence as close to 0° as possible. By tilting the solar panel to continuously face the sun, this can be achieved. This process of sensing and following the position of the sun is known as Solar Tracking. It was resolved that real-time tracking would be necessary to follow the sun effectively, so that no external data would be required in operation.

Chapter 2 : Theory

2.1 Photovoltaic technology

The principle of operation of a PV cell is shown in Fig 2.1. The most abundant and convenient source of renewable energy is solar energy, which can be harnessed by photovoltaic cells. Photovoltaic cells are the basic of the solar system. The word photovoltaic comes from "photo" means light and "voltaic" means producing electricity. Therefore, the photovoltaic process is "producing electricity directly from sunlight". The output power of a photovoltaic cell depends on the amount of light projected on the cell. Time of the day, season, panel position and orientation are also the factors behind the output power. The current-voltage and power-voltage characteristics of a photovoltaic cell are shown in Fig 2.2. Photovoltaic cells are the smallest part of a solar panel. Solar panel gives maximum power output at the time when sun is directly aligned with the panel.

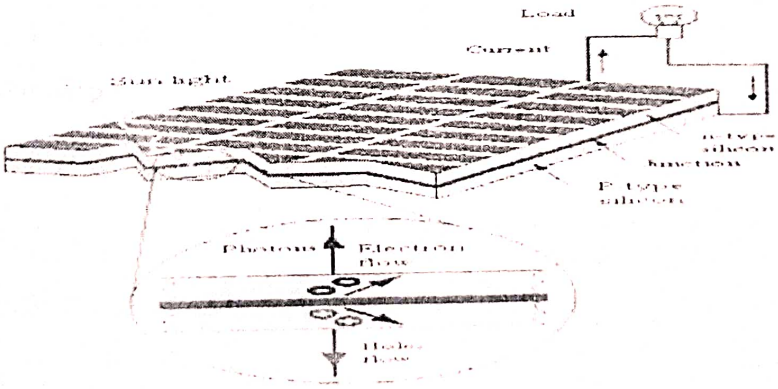


Fig 2.1. Principle of photovoltaic cell [1]

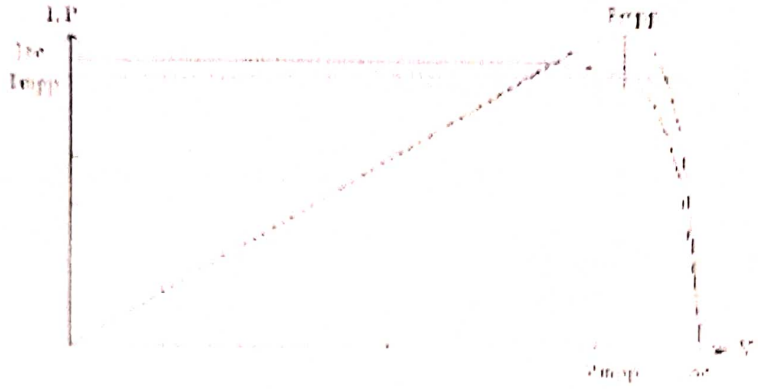


Fig 2.2: Curve of solar panel [2]

2.3 Solar Tracking system

Solar tracking is a widely-applied proven technology that increases energy production by directing or concentrated the photovoltaic to track the sun on its path from dawn until dusk. Instantaneous solar radiation collected by the photovoltaic modules, assembled in a tracking system, is higher than the critical irradiance level for a longer number of hours than in fixed systems. There are numerous types of solar trackers, of varying costs, performance and sophistication. There are static solar panels, single-axis and dual-axis solar tracker as shown in Fig.2.3.

A single-axis solar tracking system uses a tilted PV panel mount, and a single electric motor to move the panel on an approximate trajectory relative to the Sun's position. It has been estimated that the yield from solar panels can be increased by 30 - 60 % by utilizing a tracking system instead of a stationary array. Up to 40% extra power can be produced per annum using a variable elevation solar tracker. In this

2.3 Two axis solar tracking

On a long-term basis, the most solar energy can be obtained from a given area of solar modules by having the modules mounted in a 2-axis tracking system. In such a tracking system, the modules are positioned such that the angle of incidence of incoming beam radiation with the solar module is 90^0. Some systems use active tracking methods, in which the motors and/or hydraulic devices are used to position the modules, while others use passive methods, in which normally unused energy, such as heating of a fluid, is used to provide module alignment with the sun. In addition, some use sensors with new techniques to find the solar disk in the sky which is our case study, while others use computer programs that calculate the astronomical position of the sun from well-known algorithms (solar time-position calculations), and the calculations are used to control motors and gears that align the solar collector with the solar disk. Combinations of the various sub-systems are utilized in some tracking systems. Because up to 90% of the solar radiation is beam radiation sunny day, 2-axis tracking can provide a substantial gain in the solar energy harvested.

2.4 Schematic arrangement

Two-axis tracking system accommodates both degrees of freedom: azimuth and altitude. Schematic block diagram of the proposed automatic solar tracker is shown in the Fig:2.4.

Four LDRs sensors module are used and circuits are implemented in both degrees of freedom. If one of the LDR gets more light intensity than other, the microcontroller will receive a signal. And the microcontroller analyzes this data and generates a signal to actuate the motor, to move the sensor module to a position where equal light is being illuminated on pair of LDRs . The arduino is programmed to generate through azimuth as well as altitude tracking and motor rotation either clockwise or anti-clockwise direction depending on the shadow on the LDRs. If all the ten LDRs are equally illuminated by the sun, then the microcontroller will not generate any signal to actuate the motors. The signal generated by the microcontroller causes to energize the driving circuit, for the movement of server motor.

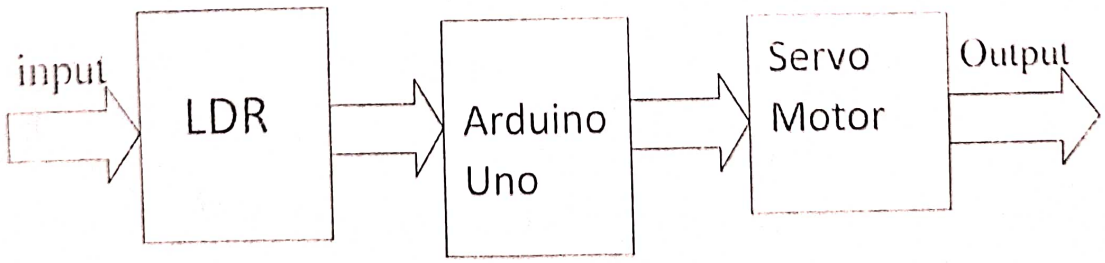


Fig. 2.4 Schematic block diagram

2.5 The sensing element and signal processing

To track the sun it is necessary to sense the position of the sun and for that electro-optical sensor is needed. Ten LDRs have been used for tracking the azimuth and altitude angle. If light falling on the device is of high frequency, photons absorbed by the semiconductor gives enough energy to bound electrons to jump into the conduction band. The resulting free electron conducts electricity, thereby lowering the resistance. In this work Ten LDRs are enough for providing the complete view of the sky and two-axis tracking. Each LDR is placed in series with a resistor of 100kΩ and Wheatstone bridge circuit is formed using all ten LDRs and ten resistors. A voltage divider circuit is formed at the respective node between LDR and a series resistor of 100kΩ. The LDR that detect the high intensity of light will send a signal to the microcontroller and the microcontroller will generate a signal that will cause the motor to rotate depending on the shadow of the LDR.

2.6 Functionality and mechanism of the sensor

The LDR sensor is a variable resistor that changes the resistance according to the intensity of incident ray illuminated onto it. As the intensity of sunlight changes, the resistance and the voltage of LDR Sensors change. The output voltage across the resistor is converted

Into digital signal at the input of the microcontroller. Based on the output of the microcontroller the DC servo motor rotates clockwise (CW) or counter clockwise (CCW).

The smart tracker panel in our project was installed with four LDRs sensors. When the sunlight falls onto the PV panel, the LDR sensors generate different voltages to move the PV panel.

The control unit is the intelligent part of the system. It consists of an Arduino UNO based on Atmega328 which receive data sent by the sensors. This data describe the sun presence sensors status, sun position sensors and butted of race end status. The treatment of the data by the control unit lets the later send the suitable control signals towards the operative part.

The driving mechanism here is the servo motors. It was controlled using the microcontroller which receives a signal from the LDRs and the analogue voltage is converted into digital signal for processing.

Chapter 3: Method

The main intention of this project is to design a high quality solar tracker. The project is divided into two parts: hardware and software.

3.1 Hardware

The main components of hardware in this project are solar panel, Light Dependent Resistor (LDR), Servo Motor and Arduino-Based Controller.

3.1.1 Light dependent resistor (LDR)

Photo resistor or light dependent resistor (LDR) showing in Fig 3.1 is a resistor in which the resistance decreases with increasing incident light intensity or exhibit photoconductivity. LDR output voltages for light intensity are shown in Table 3.1. The resistance of an LDR is extremely high, sometimes as high as 1 Mohms. The light resistances will drop dramatically when illuminated.

Fig 3.1. Light Dependent Resistor

Table 3.1: Light intensity measurement

Light intensity	LDR output (v)
dark	0.6
average	4.0
bright	4.6

3.2.2 Solar panel

Solar panels are devices that convert light into electricity. They are called "solar" panels because the most powerful source of light available is the sun. Fig 3.2 is a solar panel packaged, connected assembly of photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications.

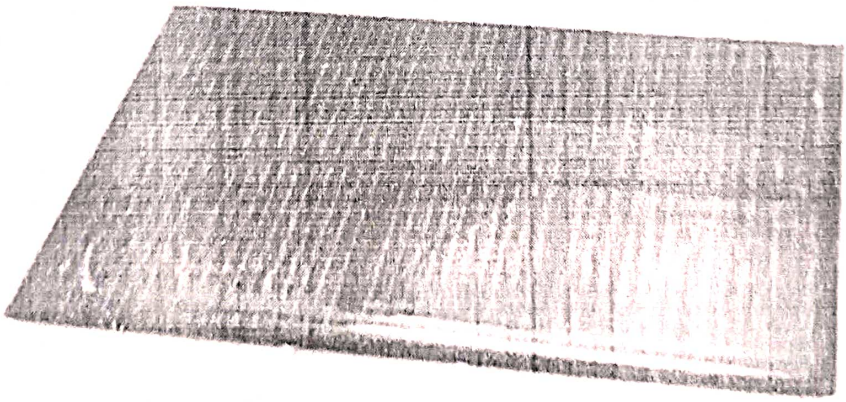


Fig 3.2. Solar Panel

3.1.3. Servo motor

A servo motor is an electrical device which can push or rotate an object with great precision. It rotates an object at some specific angles or distance. A servo motor showing in Fig 3.3 is just made up of simple motor which run through servo mechanism. It can reach a very high torque in a small and light weight packages. Due to these features they are being used in many applications like Robotics, machines, cars etc. A servo motor can usually only turn 90^0 in either direction in for a total of 180^0 movement. Servo motors are rated in Kg/cm (kilogramme per centimetre). This Kg/cm tells how much weight the servo motor can lift at a particular distance. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.

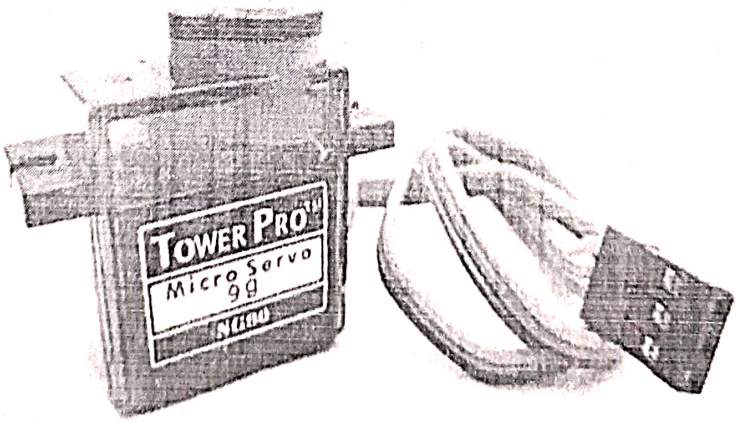


Fig 3.3. Servo Motor

3.4. Arduino

The Arduino Uno shown in Fig. 3.4 is a microcontroller board based on the Atmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. Arduino Uno has open source software that is why it's quiet easy to implement control logics on this microcontroller board. Following table shows some specification of the microcontroller board

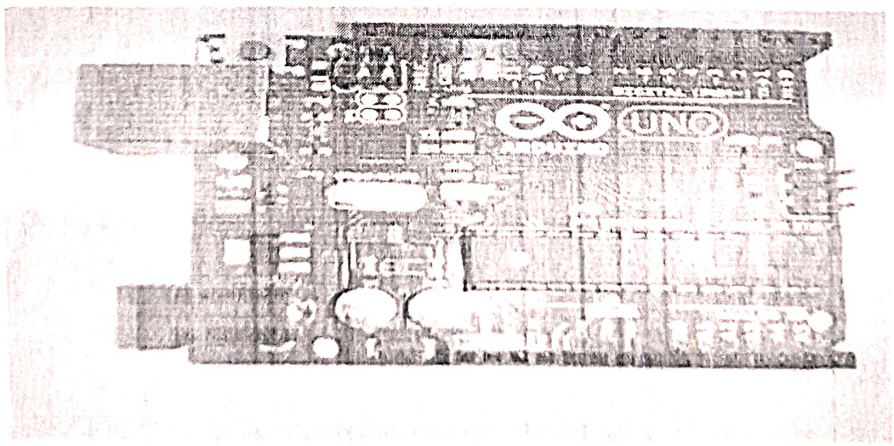


Fig 3.4. Arduino UNO board

Arduino features

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analogue Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB (ATmega328) of which 0.5 KB used by boot loader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)

Software

The software part consists of a programming language that is constructed using C programming. The codes are targeted to Arduino UNO to be compiled and uploaded. The flow of the software procedure is shown in Fig 3.5.

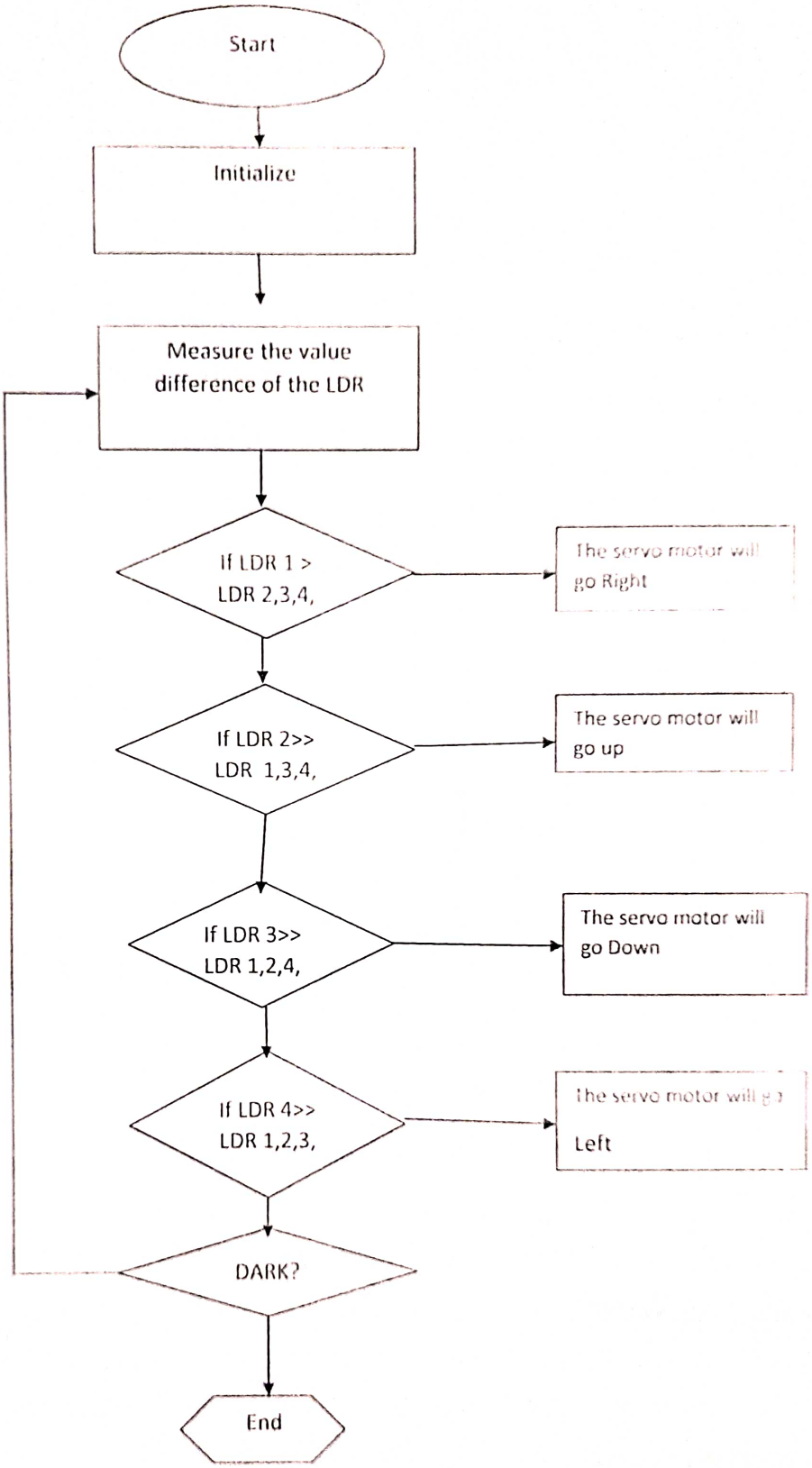


Fig 3.5. Flowchart for the overall process

3.5 Circuit Diagram

The circuit design of solar tracker is simple but setting up the system must be done carefully. Four LDRs and four 100KΩ resistors are connected in a voltage divider fashion and the output is giving to 4 Analogue input pins of Arduino. The PWM inputs of the two servo motors are given from digital pins 9 and 10 of the Arduino. The circuit diagram of this project is shown in Fig 3.6.

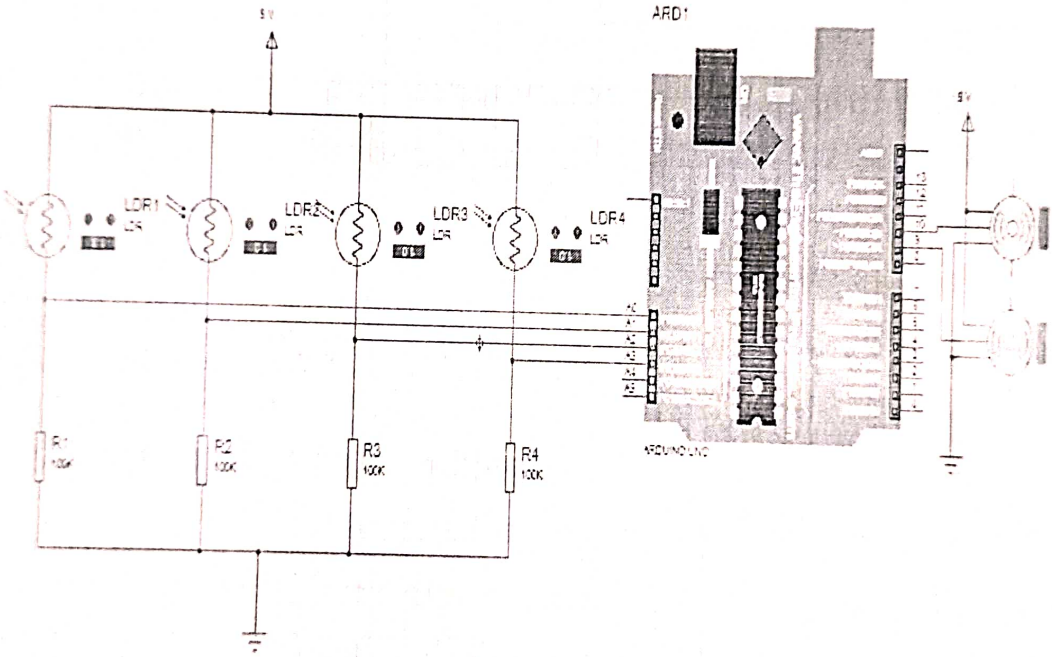


Fig 3.6: Circuit Diagram

3.4. Setup

Step 1

- Take the placard and measure according to the design
- Cut the different part of the measured placard
- Cut four tubes which support the top and bottom plaque
- Sticks the different parts accordingly

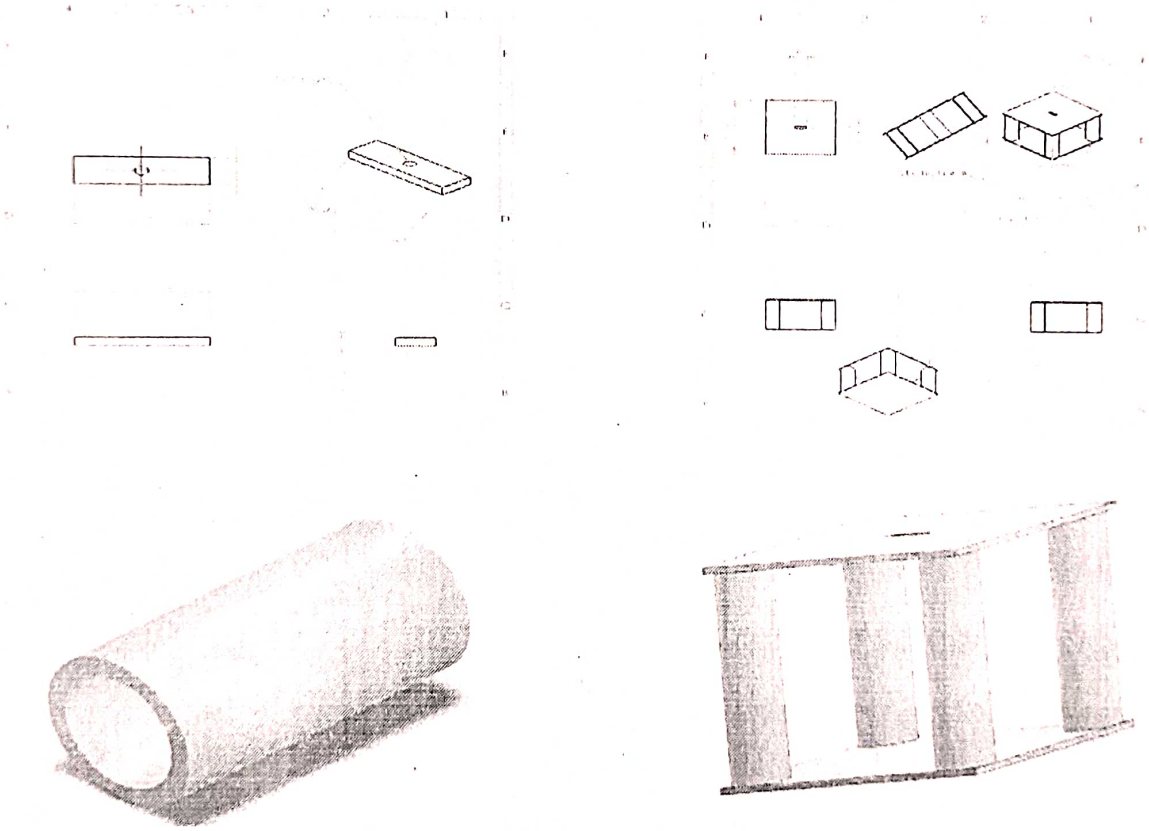
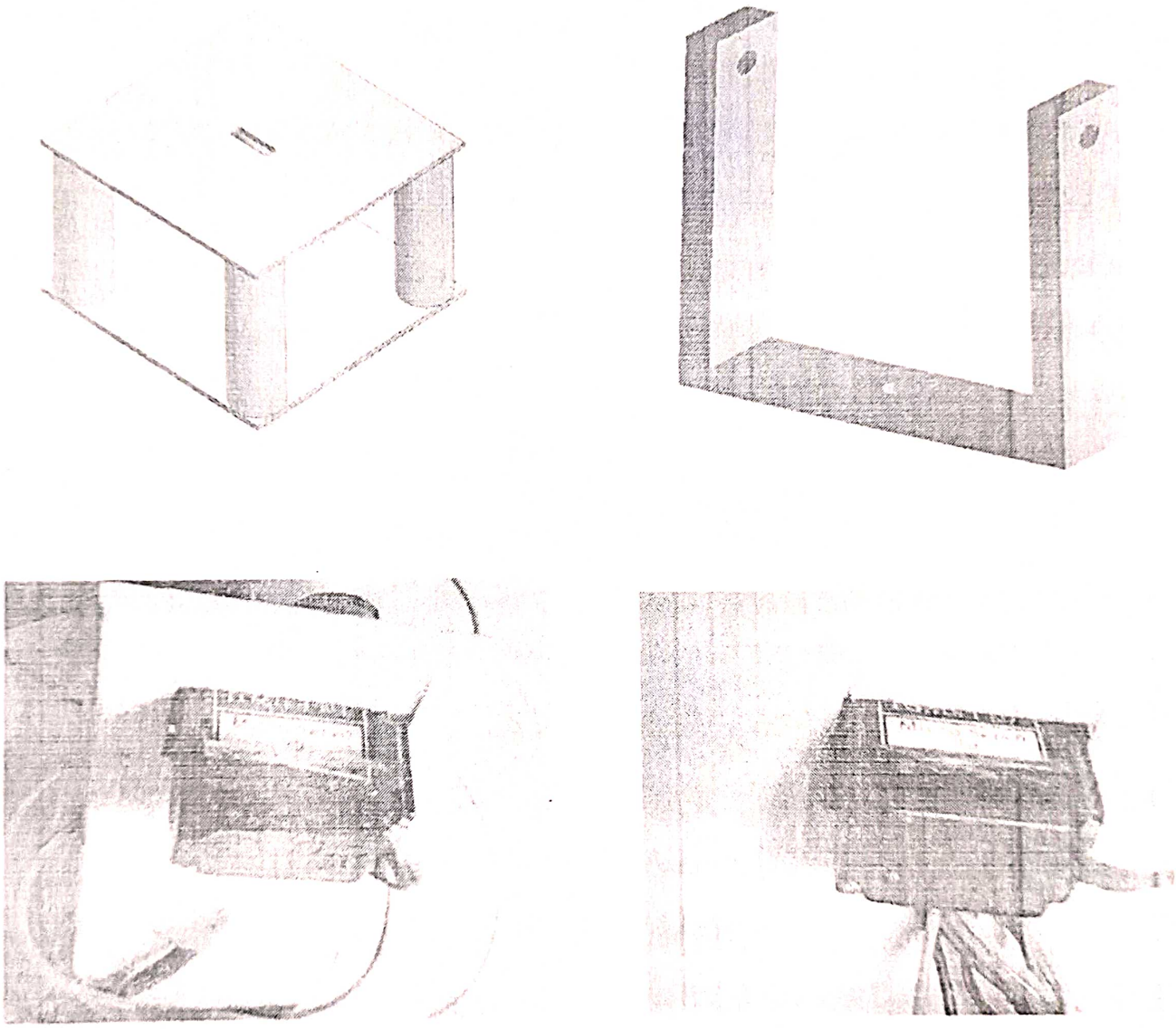


Fig 3.7 : Tubes with top and bottom plaque base setup

Step 2

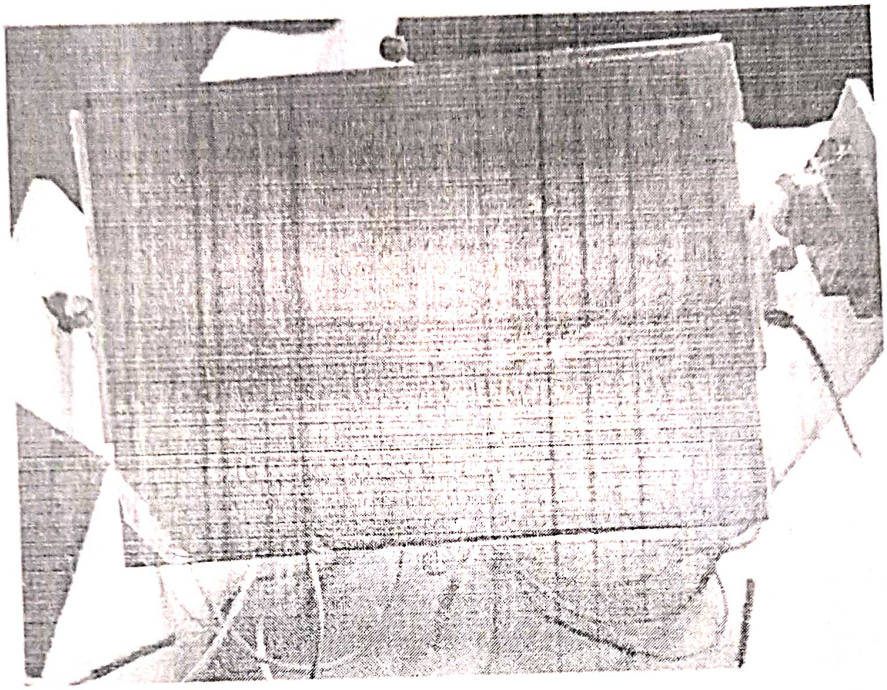
- Hole the plaque to fix the servo motors
- Now connect the servo motors to the perforated holes



3.8 : Plaque hole and servo motors fixation

Step 3

- Stick the solar panel to the plaque
- Stick the four LDRs to the plaque
- Fixe the plaque to the motor



3.9 : LDRs and solar panel fixation

Step 4

- Connect the LDRs with the wires
- Connect the servo motors and the LDRs to the breadboard
- Connect the servo motors and the breadboard to the arduino

3.10 : LDRs and servo motors connection

Step 5

- Upload the code to the arduino Uno

Solar tracker system descriptions

Designing structures

After the solar panels and other components were selected, the overall structural design of the solar tracker as seen in Fig 3.7 . The compactness of the proposed solar tracker enables it to be mounted almost everywhere. It consists of the PV panel, the servo motors and Arduino Uno and the vertical pillars with base plates support. The pillars holding panel are aligned to the sides of the panel for better flexibility during the panel rotation and the servo motors are mounted in a such way the tracker system can rotates on a dual-axis freedom of

1.6 complete proposed automatic solar tracker

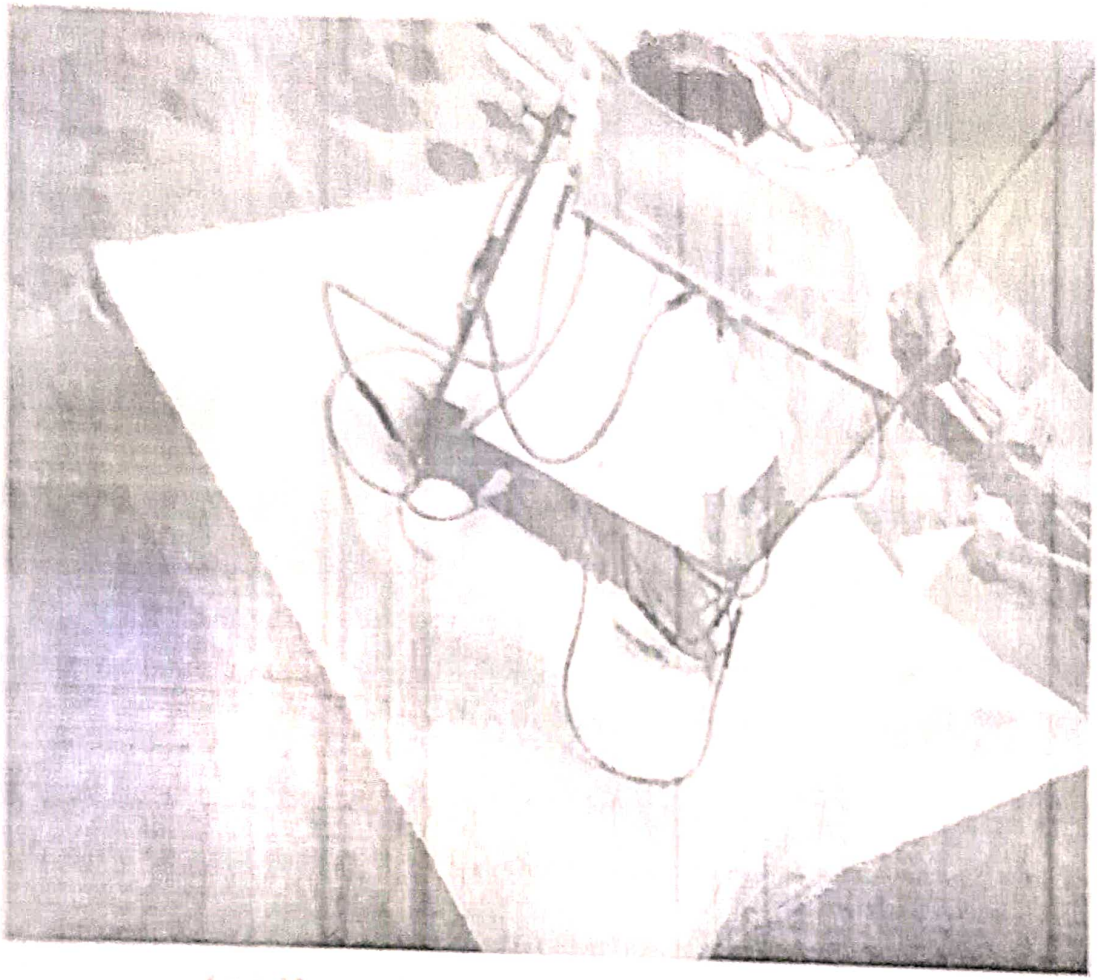


Fig : 11 complete propose d automatic solar tracker.

rotation. The sensors are fixed at the sides of the panel to obtain the sun irradiance.

3.3.3 Electrical system

The overall mechanical and electrical subsystems were integrated into the solar tracker system as shown in Fig 3.7. The block diagram of the solar tracker system consists of mostly electrical components. The solar tracker consists of the PV cells, and other subsystems such as the LDR sensors, servo motors and the microcontroller. The LDR sensors sense the sunlight intensity and send the signal to the microcontroller to rotate the PV panel via the servo motor. The servo motor was controlled using the microcontroller. The controller uses the PWM (Pulse Width Modulation) signal to drive the servo motor at a controlled speed correspond to a maximum voltage of 6 V. The PWM wave is a continuous square wave signal that changes between 0 V and 6 V. The duration or width of the pulse determines the angle of the shaft's rotation. The microcontroller target board was used to control the servo motor. It receives the signals from the LDR sensors. The analogue voltage is converted into digital signal for processing.

Chapter 4: Result and Discussion

A solar tracker was proposed, designed and constructed. The final design was successful, in that it achieved an overall power collection efficiency increased to a fixed panel for the same panel on the tracking device. the solar energy capture is maximized by a 2-axis tracking system because the solar energy is greatest on cloud-free days when there is ample direct sunshine, and response of a solar module to a ray of light is proportional to the cosine of the angle between a line perpendicular to the module surface and a direct solar ray impinging on the surface. In terms of real value, this means that the overall cost of a system can be reduced significantly, considering that much more power can be supplied by the solar array coupled to a solar tracking device. By extracting more power from the same solar panel, the cost per watt is decreased, thereby rendering solar power much more cost-effective than previously achieved using fixed solar panels. A single axis tracker offers a great power increase over a fixed solar panel, but a two-axis tracker would provide more power still. This could be a subject for further development. Solar tracking is by far the easiest method to increase overall efficiency of a solar power system for use by domestic or commercial users.

Chapter 5: Conclusion

In this project, the sun tracking system is developed based on microcontroller. The Arduino Uno is used in this system with a minimum number of components and the use of DC servo motors enables accurate tracking of the sun. It has been observed that the sun tracking systems can collect maximum energy than a fixed panel system and high efficiency is achieved through this tracker, it can be said that the proposed sun tracking system is a feasible method of maximizing the light energy received from sun. This is an efficient tracking system for solar energy collection. The method implemented in this project is simple, easy to maintain and requires no technical attention for its operation. The software developed for this work is easy to manipulate. The solar module with tracking system can collect maximum energy over a static module. Hence implementation of this technique in building solar systems will greatly improve utility satisfaction.

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