Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Special Programs for slow learners

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Remedial classes conducted for F.Y.B.B.A(CA) and S.Y.B.B.A(CA)

P.D.E.A'S

Annasaheb Magar Mahavidyalaya, Hadapsar, Pune-28

Departement of BBA(CA)

SYBBA(CA) Year-2020-21

REMEDIAL TEACHING ON DATA STRUCTURE

Sr.No.	Name of Students
1	BABAR ANIKET WALMIKI
2	BELHEKAR KUNAL SANTOSH
3	BHOIWAR MAROTI LAXMAN
4	BHONDAVE MAYUR MACHINDRA
5	GHUGE PRASHANT HAUSARAO
6	GHULE RUSHIKESH KALURAM
7	HOLE MAYURI BABASO
8	HONRAO PRATIKSHA SOMNATH
9	JADHAV PRAJAKTA BALU
10	LAWAND SURAJ SHANKAR
11	MAHATME KUNAL NATHRAV
12	MALUNJKAR SANKET RADHAKISAN
13	MUJAWAR UMARFARUK RIYAJ
14	MULANI IRFAN AYUB
15	PATOLE SWAPNIL SUNIL
16	SAKHARE GANESH BABA
17	SHAIKH TAUFIQUE ANWAR
18	SHELAR SHUBHAM GANPAT
19	SHENDAGE MILIND DATTU
20	SHENDE SUPRIYA KANTILAL
21	SIRVI DILIPKUMAR PITARAM
22	SUPEKAR RUSHIKESH DILIP
23	TANPURE ROHIT SHARAD
24	WETAL ROHAN BALASAHEB
25	ZADGE KOMAL BHAUSAHEB

PDEA'S

Annasaheb Magar Mahavidyalaya, Hadapsar, Pune-28

Department of B.B.A.

Year-2020-21

NOTICE

(Remedial Course)

Date- 03-10-2020

This is here by informing that to all the students of T.Y.B.B.A. that the Remedial course on Analysis of Financial Statements' will be starting from 05-10-2020 to 15-10-2020 on Zoom App. Lecture link will be provide you on your official WhatsApp group.

Time: 12.00pm to 1.00pm

Coordinator

H.O.D

PDEA'S

Annasaheb Magar Mahavidyalaya, Hadapsar, Pune-411028

Department of BBA

Remedial Course on Finance

Time Table – 2020-21

Days	Date	Time	No. Of Lectures
Monday	05/10/2020	12.00pm to 1.00pm	1
Tuesday	06/10/2020	12.00pm to 1.00pm	1
Wednesday	07/10/2020	12.00pm to 1.00pm	1
Thursday	08/10/2020	12.00pm to 1.00pm	1
Friday	09/10/2020	12.00pm to 1.00pm	1
Saturday	10/10/2020	12.00pm to 1.00pm	1
Monday	12/10/2020	12.00pm to 1.00pm	1
Tuesday	13/10/2020	12.00pm to 1.00pm	1
Wednesday	14/10/2020	12.00pm to 1.00pm	1
Thursday	15/10/2020	12.00pm to 1.00pm	1
		Total lectures	**10**

Coordinator

H.O.D.

PDEA'S

Annasaheb Magar Mahavidyalaya, Hadapsar, Pune-411028

Department of BBA

Student Attendance on Remedial Course (Year-2020-21)

Class:- T.Y.B.B.A

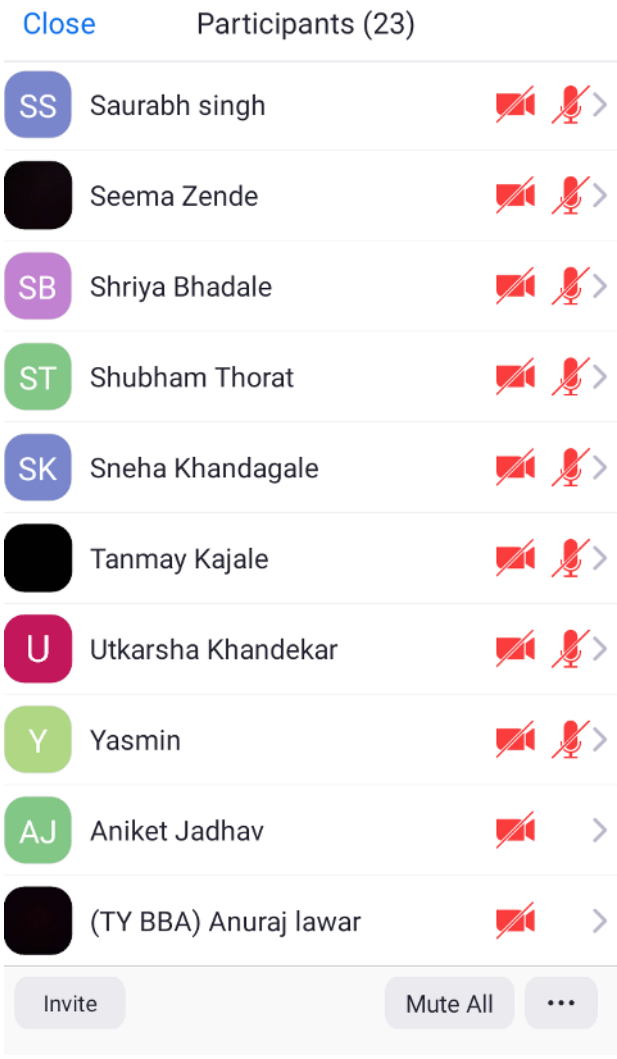
Teacher Name: Ms. Hulbatte J.K. **Subject: Analysis of Financial Statement**

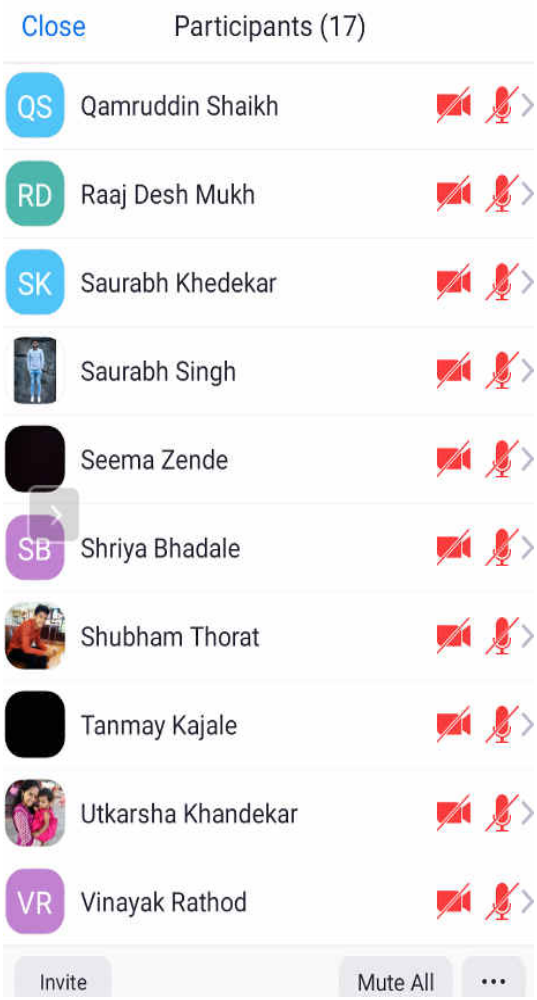
Sr No.	Name
1	Bachhire Mukesh
2	Bagal Sanskruti suhas
3	Bhadale Shriya Dnyaneshwar
4	Chourasiya Gagan
5	Deshmukh Raaj Sumant
6	Dhamal Prasad Nandu
7	Dhokale Vishal Machhindra
8	Dodake Atish Shankar
9	Gujar Bhagirath
10	Jadhav Aniket Nandu
11	Jadhav Megha Bhivaji
12	Javalkar Ranjit Bhalchandra
13	Khade Vinayak Narendra
14	Khandagale Sneha Vitthal
15	Ladkat Shyamrao Anil
16	Langhi Pooja Haridas
17	Londhe Avinash Hanumant
18	Madane kajal Tukaram
19	Mandhare Asmita Arvind
20	Mapare Priti Vijay
21	Natu Abhijit Dhanaji
22	Parmar Pooja

23	Patange Omkar
24	Pathan Yasmin Badashaha
25	Pawar Bablu Shankar
26	Paygude Gaurav Santosh
27	Phand Kapil Pralhad
28	Potdar siddharth somnath
29	Rathod Vinayak Sanjay
30	Sayyed Misba
31	Sayyed Mohsib Raisoddin
32	Shinde Hiteshwari
33	Thorat Shubham Vilas
34	Zende Sima Ashok

Coordinator

H.O.D.


Close
Participants (23)
SS
Saurabh singh
Seema Zende
SB
Shriya Bhadale
ST
Shubham Thorat
SK
Sneha Khandagale
Tanmay Kajale
U
Utkarsha Khandekar
Y
Yasmin
AJ
Aniket Jadhav
(TY BBA) Anuraj lawar
Invite
Mute All


Close
Participants (17)
QS
Qamruddin Shaikh
RD
Raaj Desh Mukh
SK
Saurabh Khedekar
Saurabh Singh
Seema Zende
SB
Shriya Bhadale
Shubham Thorat
Tanmay Kajale
Utkarsha Khandekar
VR
Vinayak Rathod
Invite
Mute All

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

PTA meetings

PDEA'S

Annasaheb Magar Mahavidyalaya, Hadapsar, Pune

M. Sc. Physics Part I and Part II

PTA meeting Report, Dept. of Physics

Date: 13.07.2021 Time 12.30 to 2.15 PM

The online PTA meeting on **Zoom plat form.**

Faculty: Science

Class: M.Sc. I and II Physics

Date: 13 th July 2021

Time: 12.30 PM

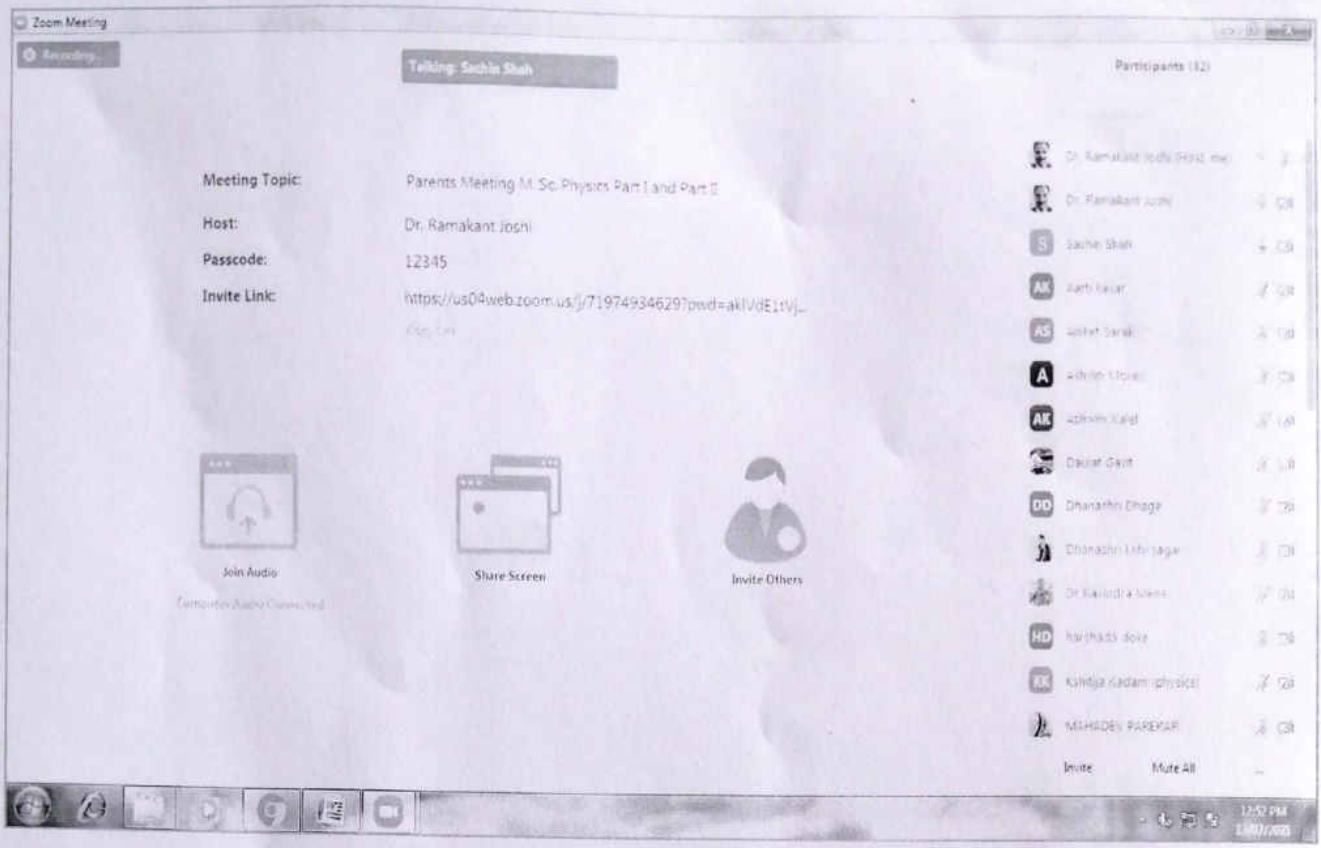
Name of class teacher: Dr. Joshi R. P.

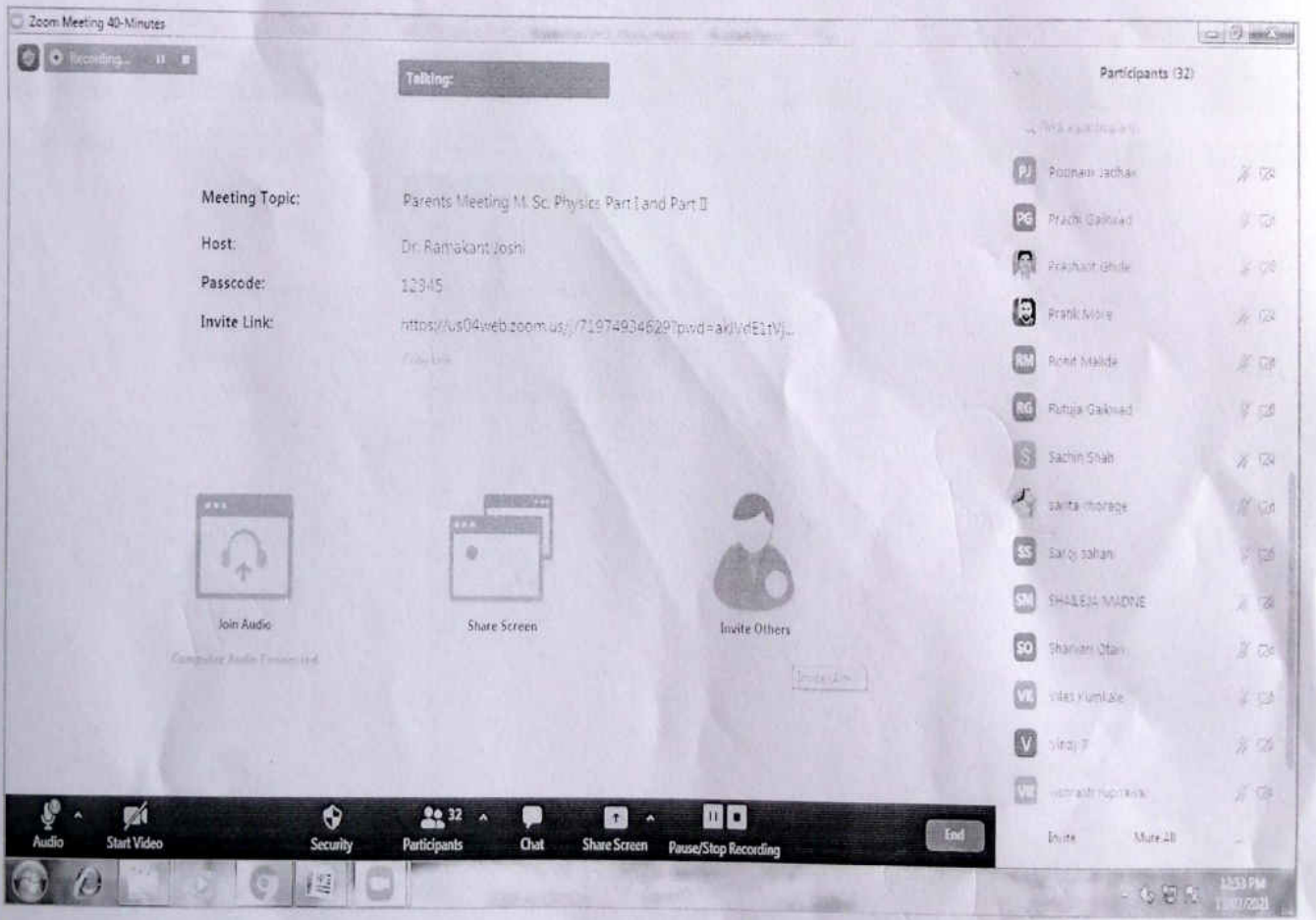
Attendance: **32** (Parents, Teachers and Students)

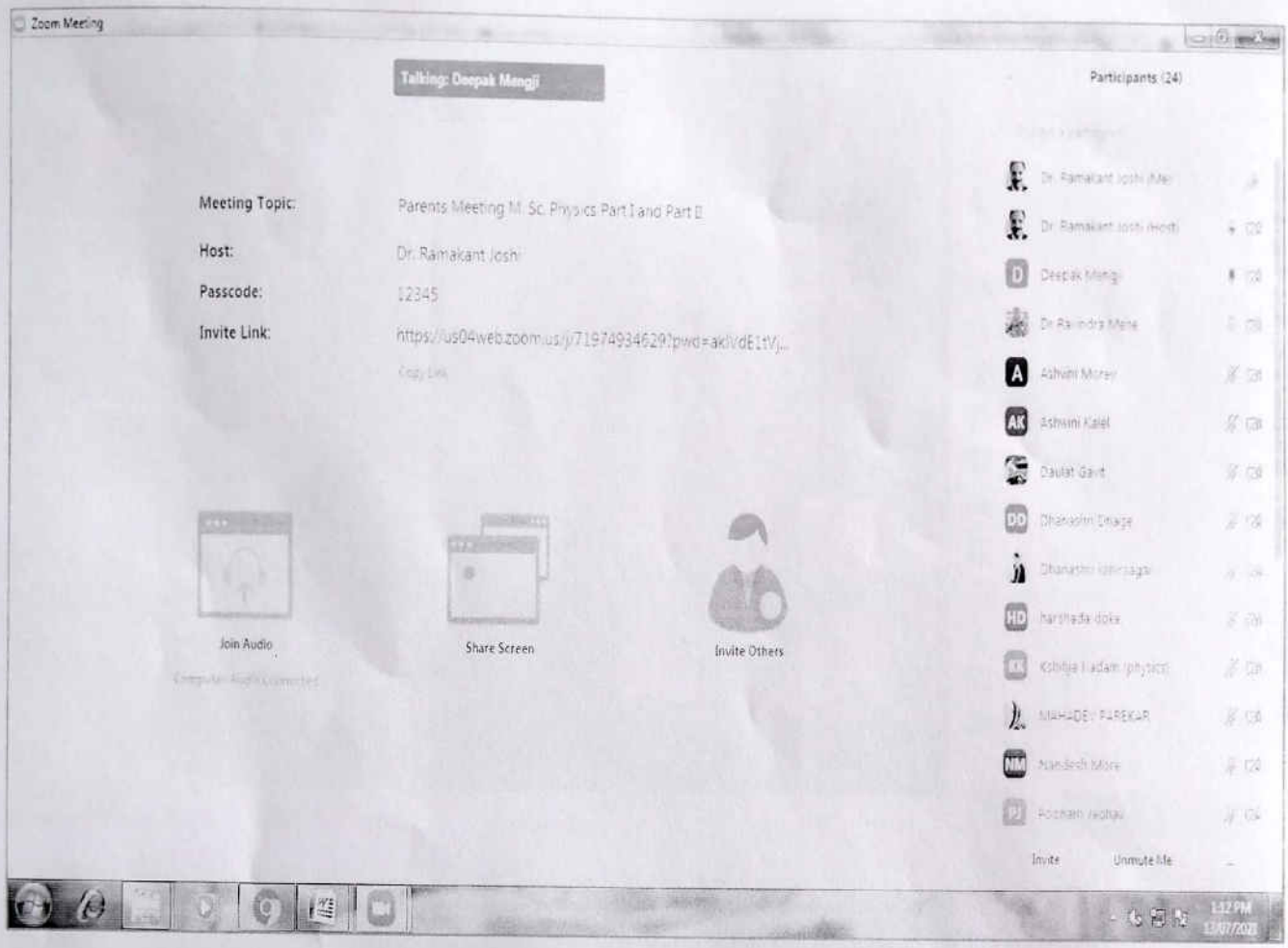
Point Discussed:

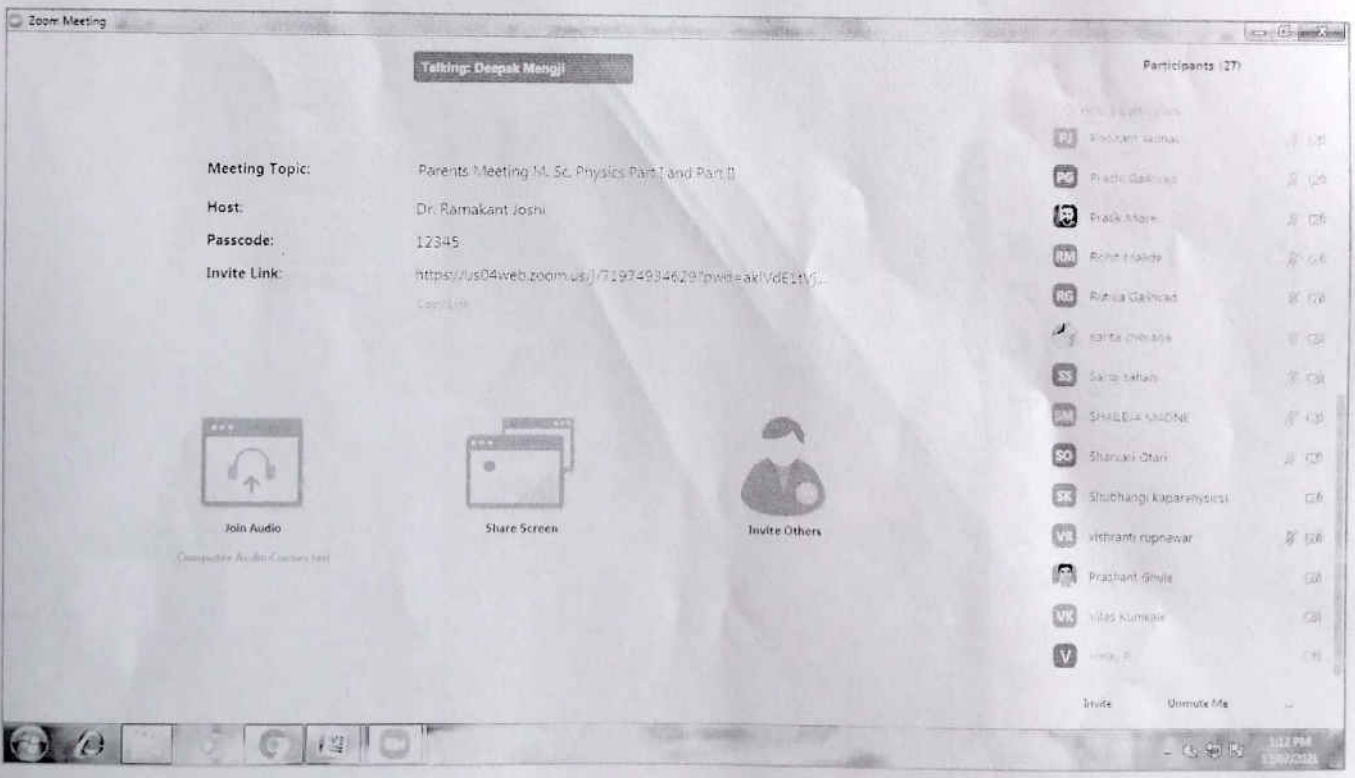
1. Dr. R. P. Joshi presents College information to students and Parents.
2. Prof. S. S. Shah gives information about Department of Physics and other activities run by college.
3. Current Examination preparation and review of previous result.
4. Preparation of Competitive exam and placement- Training Institute
5. Preparation of GET/NET/SELT and JRF examination for Research and entry at Govt. Organization.

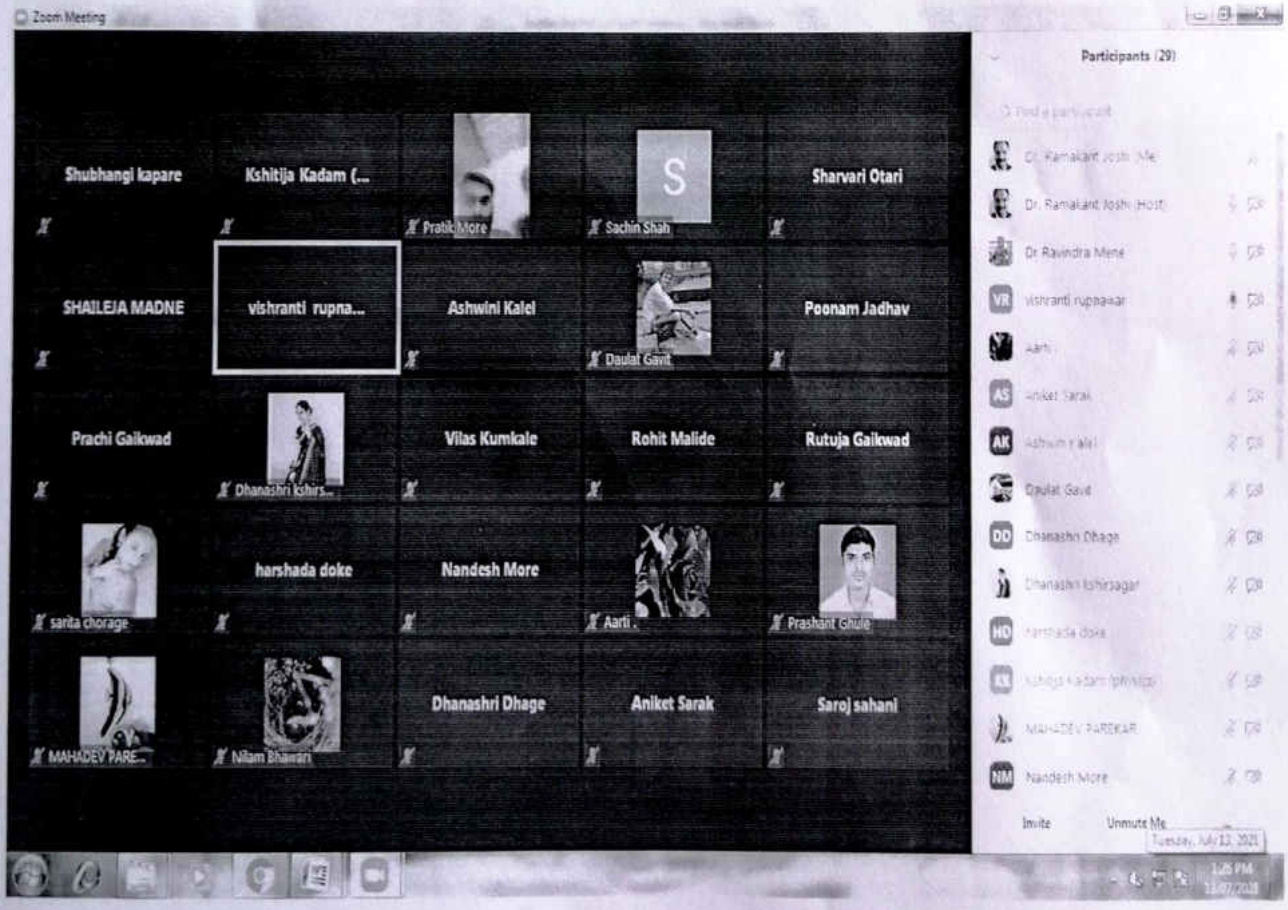
M. Sc physics In charge	Physics Department Coordinator	Head, Physics Department
Dr. R. P. joshi	Prof. S. S. Shah	Prin. Dr. P. N. Shelke
Physics Dept. Annasaheb Magar Mahavidyalaya Hadapsar, PUNE - 411 028.	Physics Dept. Annasaheb Magar Mahavidyalaya Hadapsar, PUNE - 411 028.	Head Department of Physics Annasaheb Magar College Hadapsar, Pune-28.

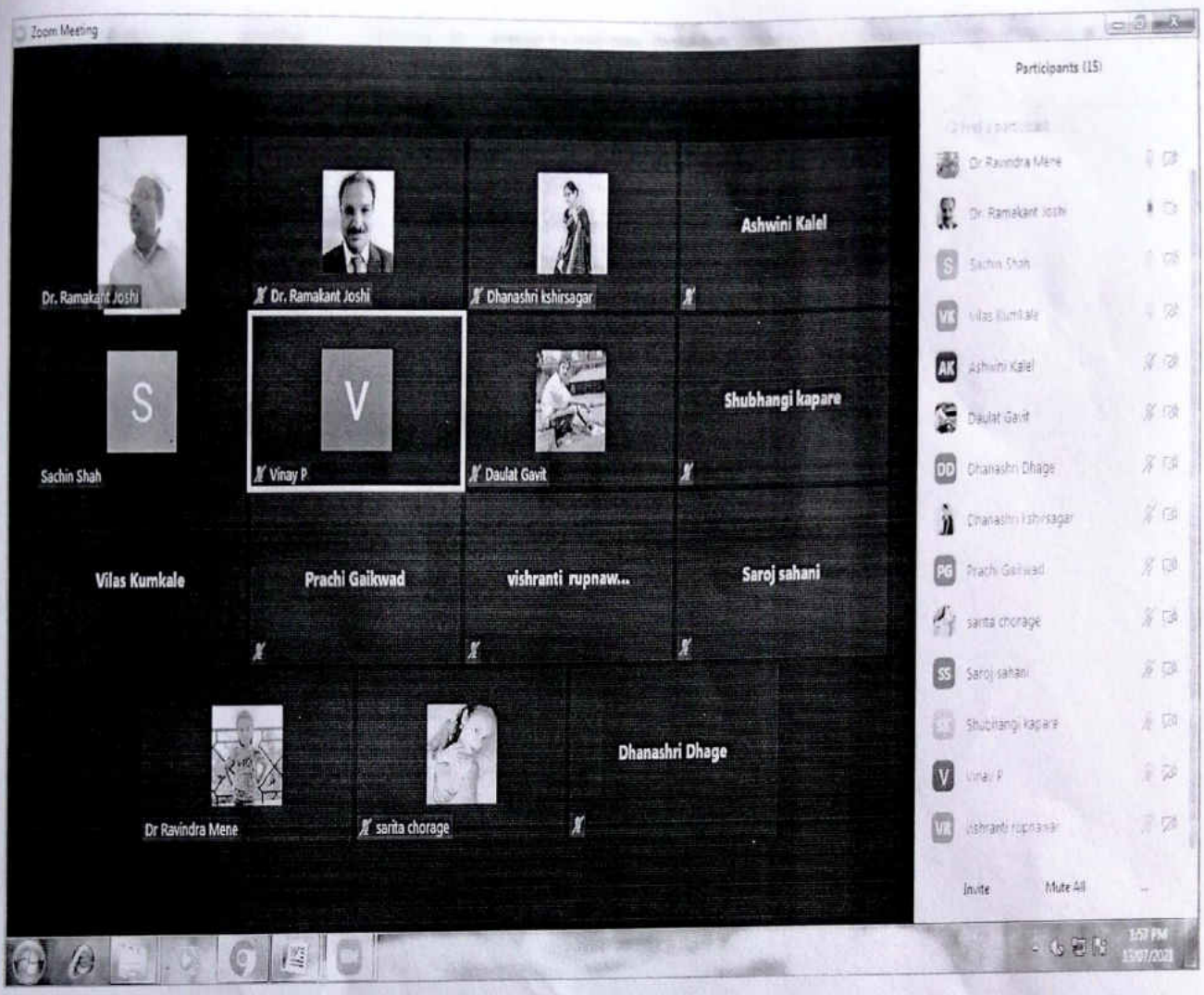












पुणे जिल्हा शिक्षण मंडळाचे ,

अण्णासाहेब मगर महाविद्यालय,

हडपसर,पुणे.

पालक सभा-2020-21

पदवी (FY,SY,& TY BA) आणि पद्व्युत्तर पदवी (M.A.) विद्यार्थ्यांना सूचित करण्यात येते की, आपल्या वर्गाची पालक सभा खालील वेळा –पत्रकाप्रमाणे गुगलमिट/ झूम अँपवर ऑनलाईन आयोजित करण्यात आलेली आहे.जे विद्यार्थी आपल्या पालकासमवेत पालक सभेस उपस्थित राहणार नाहीत ; त्यांच्यावर नियमानुसार कारवाई केली जाईल. पालकसभेची लिंक सभेच्या दिवशी सकाळी एक तास आगोदर आपल्या वर्गाच्या व्हाटसप ग्रुप वर टाकली जाईल.

अ.क्र.	वर्ग	पालक सभेचा दिनांक	पालक सभेची वेळ
1	TYBA	09/07/2021	10.30 AM
2	SYBA	10/07/2021	10.30 AM
3	FYBA	12/07/2021	10.30 AM
4	M.A.	13/07/2021	10.30 AM

पालक सभा समन्वयक चेअरमन ,वेळापत्रक

(प्रा.गांधीले जी.डी) (प्रा.नरंगलकर आर .आर.)

पुणे जिल्हा शिक्षण मंडळाचे ,

अण्णासाहेब मगर महाविद्यालय,

हडपसर,पुणे.

पालक सभा-2020-21

कला शाखेच्या सर्व विभाग प्रमुख आणि अध्यापकांना सूचित करण्यात येते की कला शाखेच्या वर्ग निहाय पालक सभा दि. 9, 10,12 आणि 13 जुलै 2021 रोजी आयोजित करण्यात आलेली आहे. सदर सभेसाठी खालील प्रमाणे अध्यापकांनी पालक सभेचे नियोजन करायचे आहे.

अ.क्र.	वर्ग	पालक सभेचा दिनांक	पालक सभेची वेळ	तुकडी/ विभाग	नियोजक प्राध्यापक
1	TYBA	09/07/2021	10.30 AM	मराठी	प्रा.शोभा तितर
				हिंदी	प्रा.. राजेश रसाळ
				इंग्रजी	प्रा. वर्षा खांदेवाले
				राज्यशास्त्र	प्रा. राहुल नरंगलकर
				मानसशास्त्र	प्रा. अश्विनी डोके
				भूगोल	प्रा. सविता गायकवाड
				अर्थशास्त्र	प्रा. आनंत माने
2	SYBA	10/07/2021	10.30 AM	मराठी	प्रा.. नाना पवार
				हिंदी	प्रा. स्नेहा हिंगमिरे
				इंग्रजी	प्रा. धीरज देशमुख
				राज्यशास्त्र	प्रा. नितीन लगड
				मानसशास्त्र	प्रा. अश्विनी
				भूगोल	प्रा.गणेश गांधीले

				अर्थशास्त्र	प्रा. आनंद सांरगे
3	FYBA	12/07/2021	10.30 AM	A,B & C	प्रा. शशिकला वाल्मिकी प्रा. प्रा. आनंत माने प्रा. राहुल नरंगलकर प्रा.गणेश गांधीले
4	M.A.	13/07/2021	10.30 AM	मराठी	प्रा.शोभा तितर प्रा. वंदना सोनावले
				हिंदी	प्रा.. राजेश रसाळ प्रा.
				इंग्रजी	प्रा. वर्षा खांदेवाले प्रा.
				राज्यशास्त्र	प्रा. राहुल नरंगलकर प्रा. शीतल गायकवाड
				अर्थशास्त्र	प्रा. आनंत माने प्रा. प्रवीण पोतदार
				भूगोल	प्रा. आनंत माने प्रा. शीतल गायकवाड

पुणे जिल्हा शिक्षण मंडळाचे ,

अण्णासाहेब मगर महाविद्यालय,

हडपसर,पुणे.

पालक सभा-2020-21

कला शाखेच्या सर्व विभाग प्रमुख आणि अध्यापकांना सूचित करण्यात येते की कला शाखेच्या वर्ग निहाय पालक सभा दि. 9, 10,12 आणि 13 जुलै 2021 रोजी आयोजित करण्यात आलेली आहे. सदर सभेसाठी अध्यापकांकडून खालील बाबींची पूर्तता होणे अपेक्षित आहे.

१. वर्ग नियंत्रकांनी (Mentor) आपल्याकडे सुपूर्द केलेल्या FY व SYBA च्या विद्यार्थ्यांचा प्रथम सत्र (Semester -I) परीक्षेच्या

निकालाची चर्चा विद्यार्थी आणि पालकांसी करणे.तसेच सेमिस्टर परीक्षा पद्धती,अंतर्गत मूल्यमापन याची माहिती विद्यार्थी आणि पालकांना देणे .

२. T.Y. B. A. विद्यार्थ्यांच्या वर्गातील उपस्थिती, सत्रांत परीक्षेचे गुण या बाबींची माहिती विद्यार्थी आणि पालकांना देणे .

३. पालक सभेतील विद्यार्थी / पालकांना Feedback form भरून तो जमा करण्यास सांगणे.

४.पालक सभेतील विद्यार्थी / पालकांच्या उपस्थिती अहवाल तसेच प्रत्येक सभेचे कमीतकमी दोन स्क्रीन शॉट्स सभेनंतर पालक सभा समन्वयकांकडे सुपूर्द करणे .

५ . सर्व विभाग प्रमुख आणि अध्यापकांनी आपापल्या विषयाच्या (Special Subject) सर्व

विद्यार्थी / पालकांशी विशेषत: सातत्याने वर्गात अनुपस्थित राहणाऱ्या विद्यार्थ्यांना फोन ,email

& SMS द्वारे संपर्क साधून पालक सभेस उपस्थीत राहण्यास प्रवृत्त करावे

पालक सभा समन्वयक	चेअरमन ,वेळापत्रक
(प्रा.गांधीले जी.डी)	(प्रा.नरंगलकर आर .आर.)

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Special programs for advance learners

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Students participation in Webinar:

Pune District Education Association's

ANNASAHEB MAGAR MAHAVIDYALAYA,

Hadapsar, Pune – 411028. Maharashtra.(INDIA)

One Day State Level Webinar

On

"Research Opportunities in Higher Studies"

CERTIFICATE

This is to certify that, Desai Monika Sudhir

Annasaheb Magar Mahavidya Hadapsar pune-28

has participated in One Day State Level Webinar On **"Research Opportunities in Higher Studies"** on Friday 27th, August 2021, organized by Department of Physics Annasaheb Magar Mahavidyalaya, Hadapsar Pune - 411028.

Dr. R. U. Mene **Org. Secretary**	**Dr. R. P. Joshi** **Co ordinator**	**Prof. S. S. Shah.** **Convener**	**Dr. Pandit N. Shelke** **Principal**

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Students Oral, Poster presentation in Webinar

पुणे जिल्हा शिक्षण मंडळाचे,
अण्णासाहेब मगर महाविद्यालय,हडपसर,पुणे
भूगोल विभाग
वसुंधरा सप्ताह कार्यक्रम पत्रिका
२०२०-२१

अ. न	**दिनांक व वेळ**	**कार्यक्रम**
1	२७ जानेवारी २०२१ सकाळी ११ वाजता.	वसुंधरा सप्ताह उद्घाटन समारंभ
2	२८ जानेवारी २०२१ सकाळी ११ वाजता.	भौगोलिक सामान्य ज्ञान स्पर्धा
3	२८ जानेवारी २०२१ सकाळी ११ वाजता.	निबंध स्पर्धा
4	२९ जानेवारी २०२१ सकाळी ११ वाजता.	भौगोलिक ppt स्पर्धा
5	३० जानेवारी २०२१ सकाळी ११ वाजता.	भौगोलिक ई-पोस्टर्स स्पर्धा

6	१ फेब्रुवारी २०२१ सकाळी ११ वाजता.	वसुंधरा समारोप कार्यक्रम व भूगोल दिना निमित्त विशेष व्याख्यान

पुणे जिल्हा शिक्षण मंडळाचे,
अण्णासाहेब मगर महाविद्यालय,हडपसर,पुणे
भूगोल विभाग
वसुंधरा सप्ताह कार्यक्रम तपशील व विजेते

२०२०-२१

अ न	दिनांक	स्पर्धेचे नाव	नाव नोंदणी केलेले स्पर्धक संख्या	प्रत्यक्ष सहभागी स्पर्धक	उपस्थित विध्यार्थी संख्या	उपस्थित मान्यवर/परीक्षक
१	२७/०१/२०२१	वसुंधरा सप्ताह उद्घाटन समारंभ	----	----	३५	उद्घाटक- प्राचार्य.डॉ पंडित शेळके उप प्राचार्य डॉ भाऊसाहेब बेंद्रे, प्राचार्य डॉ अनंत माने,डॉ.रमाकांत

						जोशी,प्रा.नितीन लगड
२	२८/०१/२०२१	भौगोलिक सामान्य ज्ञान स्पर्धा	८५	४६	४६	स्पर्धेचे परीक्षक- डॉ सविता कुलकर्णी, प्रा.गणेश गांधीले, प्रा.शीतल गायकवाड प्रा.धनाजी व्यवहारे
३	२८/०१/२०२१	निबंध स्पर्धा	२४	७	७	स्पर्धेचे परीक्षक- प्रा.शीतल गायकवाड प्रा. टिना चौधरी

४	२९/०१/२०२१	भौगोलिक ppt स्पर्धा	२६	६	२५	स्पर्धेचे परीक्षक- डॉ सविता कुलकर्णी, प्रा.गणेश गांधीले, प्रा.शीतल गायकवाड
५	३०/०१/२०२१	भौगोलिक ई-पोस्टर्स स्पर्धा	७	६	३०	स्पर्धेचे परीक्षक- डॉ सविता कुलकर्णी, प्रा.शीतल गायकवाड प्रा.धनाजी व्यवहारे
६	०१/०२/२०२१	वसुंधरा समारोप कार्यक्रम			६५	डॉ सविता कुलकर्णी,

						प्रा.गणेश गांधीले, प्रा.शीतल गायकवाड प्रा.धनाजी व्यवहारे

स्पर्धेचा निकाल:

अ न	स्पर्धेचे नाव	विजेते स्पर्धक	वर्ग
१	भौगोलिक सामान्य ज्ञान स्पर्धा	१.येळे नेहा गणेश २.मढवी मोनिका अशोक ३.शेख अझर रसूल	M.A. I TYBA TYBA

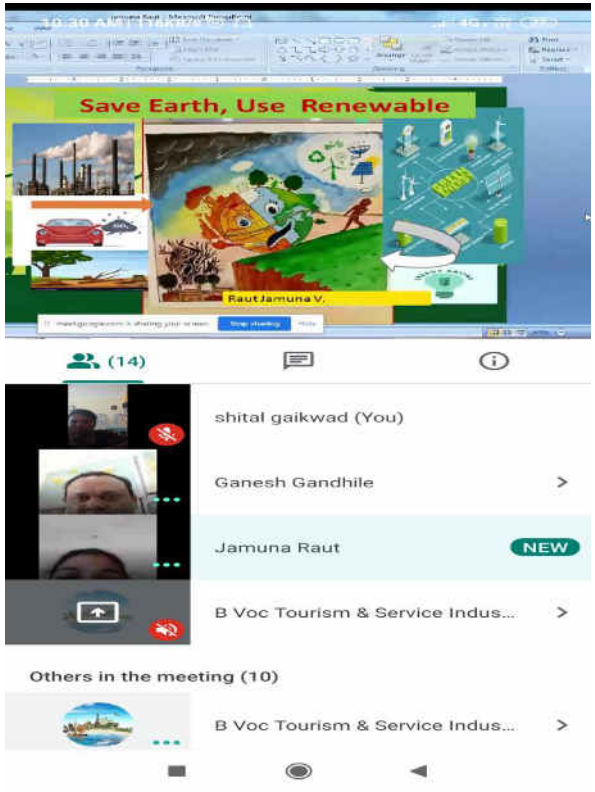
२	निबंध स्पर्धा	१. आधावडे हेमंत उत्तम २. माने सारिका ३. साळवे शीतल	TY.B.Voc SYBA M.A.-
3	भौगोलिक ppt स्पर्धा	१.हिंगणे श्रद्धा देविदास २.आधावडे हेमंत उत्तम २ शेख अझर रसूल ३.वसावे सुशीला जालशिंग	M.A. I TYBVoc TYBA M.A. I
४	भौगोलिक ई-पोस्टर्स स्पर्धा	१. हिंगणे श्रद्धा देविदास १. आधावडे हेमंत उत्तम २. राऊत जमुना विरजी ३. पडवी सुप्रिया गणपत	M.A. I TYBVoc M.A. I M.A. I

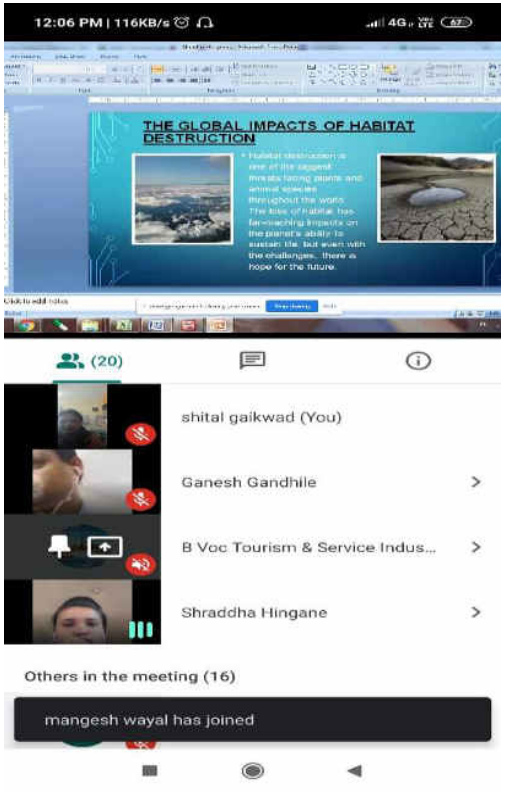
हडपसर : अण्णासाहेब मगर विद्यालयात पृथ्वीगोलाचे पूजन करून वसुंधर सप्ताहाचे उद्घाटन करण्यात आले.

मगर महाविद्यालयात वसुंधरा सप्ताह उत्साहात

हडपसर, ता. ३० : विद्यार्थ्यांमध्ये भूगोल विषयाची आवड वाढावी, या विषयाच्या अभ्यासातून करियरच्या संधी उपलब्ध व्हाव्यात या उद्देशाने भूगोल दिनाचे औचित्य साधून पुणे जिल्हा शिक्षण मंडळाच्या अण्णासाहेब मगर महाविद्यालयाच्या भूगोल विभागाच्या वतीने वसुंधरा सप्ताहाचे आयोजन करण्यात आले आहे. पृथ्वीगोलाचे पूजन करून वसुंधर सप्ताहाचे उद्घाटन महाविद्यालयाचे प्राचार्य डॉ. पंडीत शेळके यांच्या हस्ते करण्यात आले. यावेळी महाविद्यालयाचे उपप्राचार्य डॉ. भाऊसाहेब बेंद्रे, डॉ. ए. बी. माने, प्रा. नितीन लगड, भूगोल विभागाचे प्रा. गणेश गांधिले, प्रा. धनाजी व्यवहारे, प्रा. टीना चौधरी, प्रा. शितल गायकवाड, डॉ. सविता कुलकर्णी उपस्थित होते.

प्राचार्य शेळके म्हणाले, 'भूगोल विषयामध्ये विविध विषयांचा अंतर्भाव होत असल्याने, शास्त्र, वाणिज्य आणि कला या तीनही शाखांचा या विषयांशी संबंध असतो. भूगोल विषयामध्ये संशोधनाच्या अनेक संधी असून पर्यटनासारख्या विषयाचा भूगोलाशी जवळचा संबंध आहे. अशा उपक्रमामुळे विद्यार्थ्यांमध्ये या विषयाची आवड निश्चितच वाढेल.'


Save Earth, Use Renewable
Raut Jamuna V.
(14)
shital gaikwad (You)
Ganesh Gandhile
Jamuna Raut
NEW
B Voc Tourism & Service Indus...
Others in the meeting (10)
B Voc Tourism & Service Indus...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THE GLOBAL IMPACTS OF HABITAT DESTRUCTION
(20)
shital gaikwad (You)
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B Voc Tourism & Service Indus...
Shraddha Hingane
Others in the meeting (16)
mangesh wayal has joined

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Guest Lectures

Pune District Education Association's

Annasaheb Magar Mahavidyalaya Hadapsar, Pune-28

Report on Career Opportunities in Government Jobs for Zoology Students

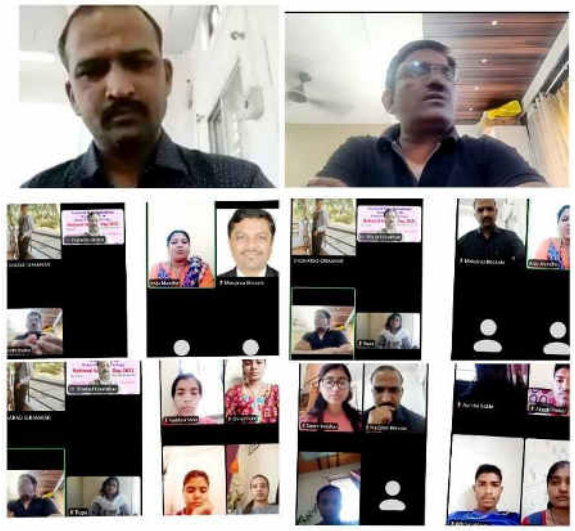
Name of Department	**Zoology**	Academic Year	**2020-2021**

National Science Day-2021 was celebrated on 28th February 2021 in the Department of Zoology of PDEA's Annasaheb Magar College, Hadapsar, Pune-28. On the occasion of National Science Day, the Department had organized an online lecture of Dr. Malojiraje Bhosale on "Career Opportunities in Government Jobs for Zoology Students". In the online lecture Hon'ble. Dr. Malojiraje Bhosale introduced various government job opportunities for Zoology students. He also motivated students regarding how to face competitive examinations in future. Principal Dr. Pandit Shelke said that students should take advantage of all the facilities available in the college to shape their future and brighten the name of the college. The introductory part of the program was given by the Head of the Zoology Department, Dr. Sharad Giramkar. In the online lecture 67 students had participated. The program was anchored by Dr. Anju Mundhe. Mrs. Rupali Bhavsar thanked the audience. The program was a success with the help of Mrs. Irfana Mulla, Mr. Sandipan Pawar, Mr. Narayan Khomane and Mr. Sanjay Pawar.

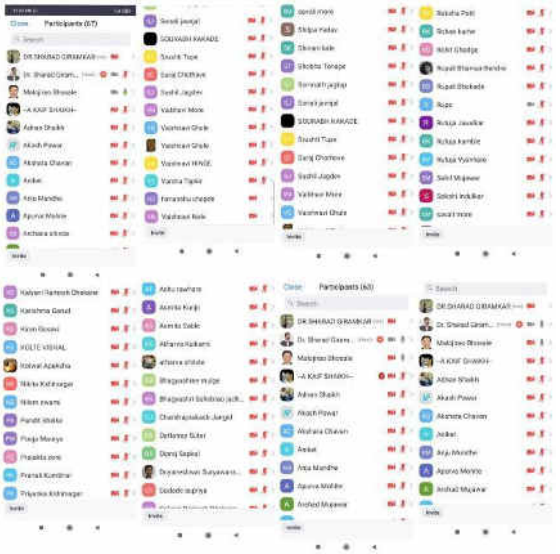
Youtube Link on online lecture by Dr. Malojiraje Bhosale:👇

https://youtu.be/trJ9W-b9HFI

Glimpse of programme:



Participants in online lecture"



Attendance: 67 students attended online lecture

PDEA's Annasaheb Magar Mahavidyalaya

Guest lecture for students / Activity Audit Report Year 2020-2021

Department of Botany

Date : 03/02/2021

1. Title of Workshop: **"Guest lecture on World Wetland Day 2021"**
2. Occasion: Birthday celebration of Hon. Sharadchandraji Pawar.
3. Names of the resource person: **Dr. Mahesh Shindikar**
4. Names of students of core committee : F.Y.B.Sc , S.Y.B.Sc & T.Y.B.Sc
5. Attach list of student members of the activity group (Faculty Wise and Degree/ Junior):

   Attendance list attached.
6. Aims and objectives of the Lecture :

   To generate the awareness about the World Wetland Day and conservation of wetland life.
7. Was the activity calendar prepared? Yes / No: Yes
8. Functions / duties allotted to committee members

1.	Welcome committee:	Dr. Danai-Tambhale S.D.
2.	Organization Committee:	Dr. Shirurkar D.D. Dr. Ranadive K.R
3.	Hall arrangement committee:	-

9. Whether other members were co-opted? Yes/No if yes, list names and duties allotted. : N.A
10. Participation of audience

    No. of Students: 76 (**Boys -**18, **Girls – 58**)

    No. of Staff: 03

    No. of Committee Members: 03
11. Activity report submitted to

    a) Principal / Vice Principal / Registrar: Yes

    b) HODS for monthly report : Yes

    c) Magazine : Yes

    d) IQAC: Yes
12. Mode of feedback from students/teacher and action taken on it to improve.

. Students express their opinions orally after lecture.

13 How do your activities contribute to the mission and vision of the institution?

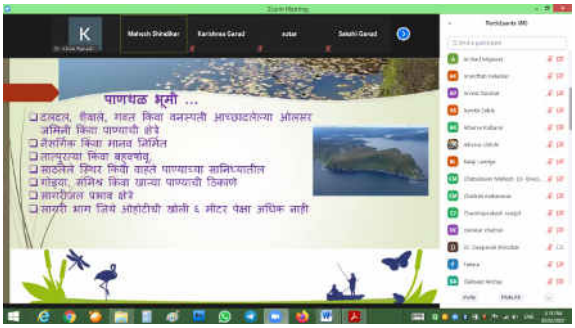
. It helped to improve knowledge regarding scientific sketching, drawings and labelling.

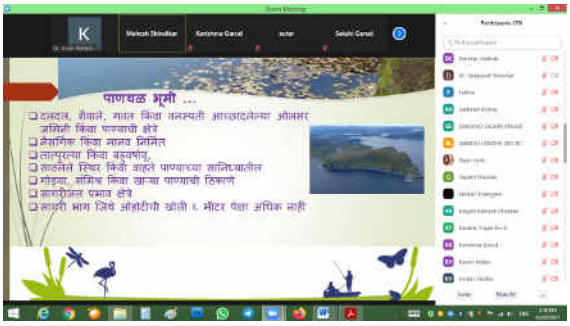
14 Suggestions, if any

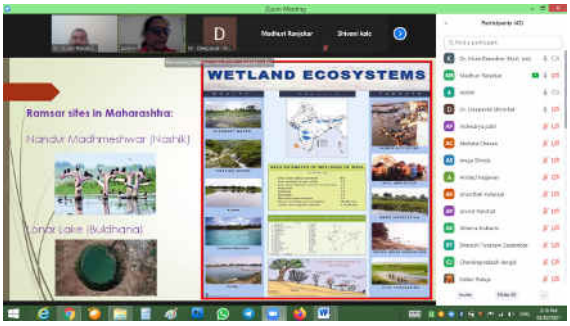
. N.A

15 Photographs

.







Date:- 02/02/2021

Co-ordinator
IQAC Committee
Annasaheb Magar Mahavidyalaya,
Hadapsar, Pune-28

Name & Signature of
Convener
Dr. Ranadive K. R.

Name & Signature of
HOD
Dr. Shirur Head D.
Department of Botany
Annasaheb Magar Mahavidyalaya,
Hadapsar, Pune-411028,

Dr. Kiran Ranadive is inviting you to a scheduled Zoom meeting.

Topic: Department of Botany lecture series-Wetland Day at 2.00pm on 03.02.2021

Time: Feb 3, 2021 02:00 PM Mumbai, Kolkata, New Delhi

Join Zoom Meeting

https://us04web.zoom.us/j/77485942297?pwd=aThRSUlFTzhqUFprcCtrbVFleVdkQT09

Meeting ID: 774 8594 2297

Passcode: 1VrUUY


You are viewing Mahesh Shindikar's screen
View Options
Dr. Kiran Ranadi...
Admin
Dr. Deepavali Sh...
atharva shitole
Akshay Bhosale
Participants (79)
Find a participant
Dr. Kiran Ranadive (Host, me)
Mahesh Shindikar
Dr. Deepavali Shirurkar
Aditya Gaikwad
Admin
Adnan Shaikh
Aishwarya Magare
Aishwarya patil
Akshata Chavan
Akshay Bhosale
Aniket shinde
Anita Gadekar
Anuja Shinde
arati rajendra javalkar
Invite
Mute All
०२ फेब्रुवारी
जागतिक पाणथळ भूमी दिन – २०२१
(आर्द्रभूमी आणि पाणी)
डॉ. महेश शिंदीकर
उपयोजित विज्ञान विभाग
अभियांत्रिकी महाविद्यालय पुणे
सदस्य: महाराष्ट्र राज्य किनारपट्टी व्यवस्थापन प्राधिकरण
सदस्य: कोंकण पाणथळ भूमी तक्रार निवारण समिती
इ-मेल : maheshshindikar@gmail.com
भ्रमणध्वनी : ९४२२५१८२९१
Mute
Stop Video
Security
Participants
Chat
Share Screen
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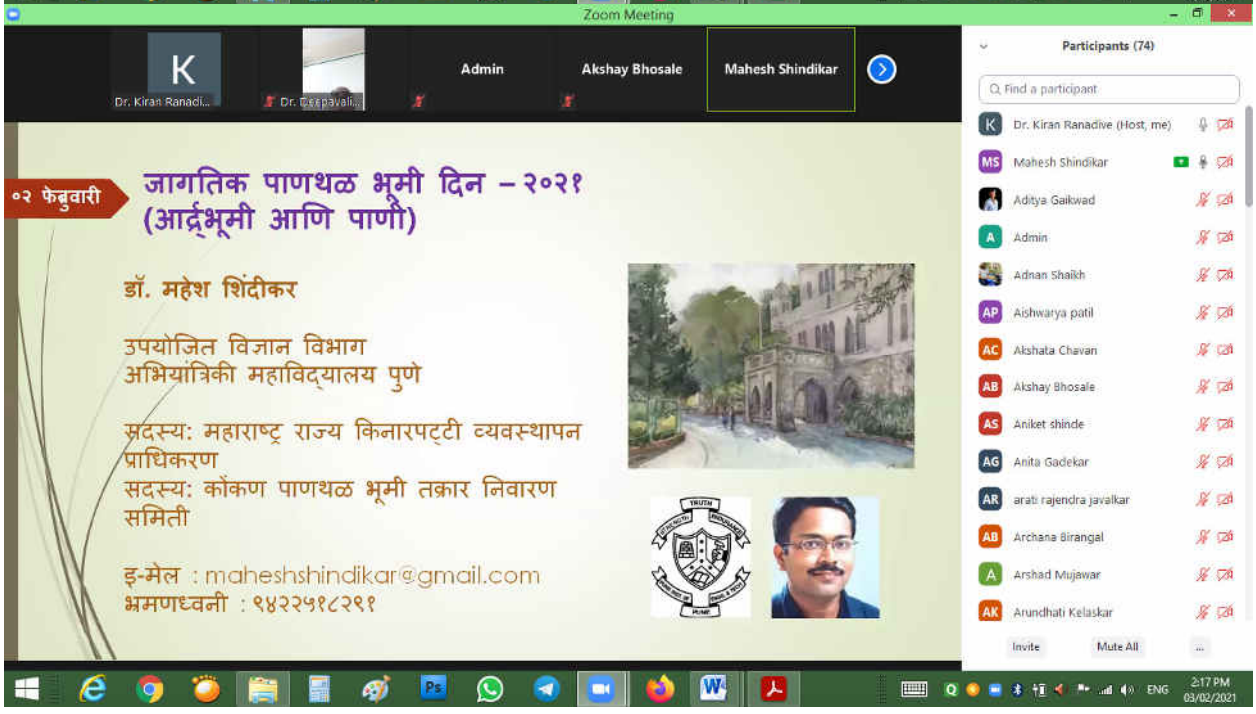
03/02/2021


Zoom Meeting
Dr. Kiran Ranadi...
Admin
Akshay Bhosale
Mahesh Shindikar
Participants (74)
Find a participant
Dr. Kiran Ranadive (Host, me)
Mahesh Shindikar
Aditya Gaikwad
Admin
Adnan Shaikh
Aishwarya patil
Akshata Chavan
Akshay Bhosale
Aniket shinde
Anita Gadekar
arati rajendra javalkar
Archana Birangal
Arshad Mujawar
Arundhati Kelaskar
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इ-मेल : maheshshindikar@gmail.com
भ्रमणध्वनी : ९४२२५१८२९१
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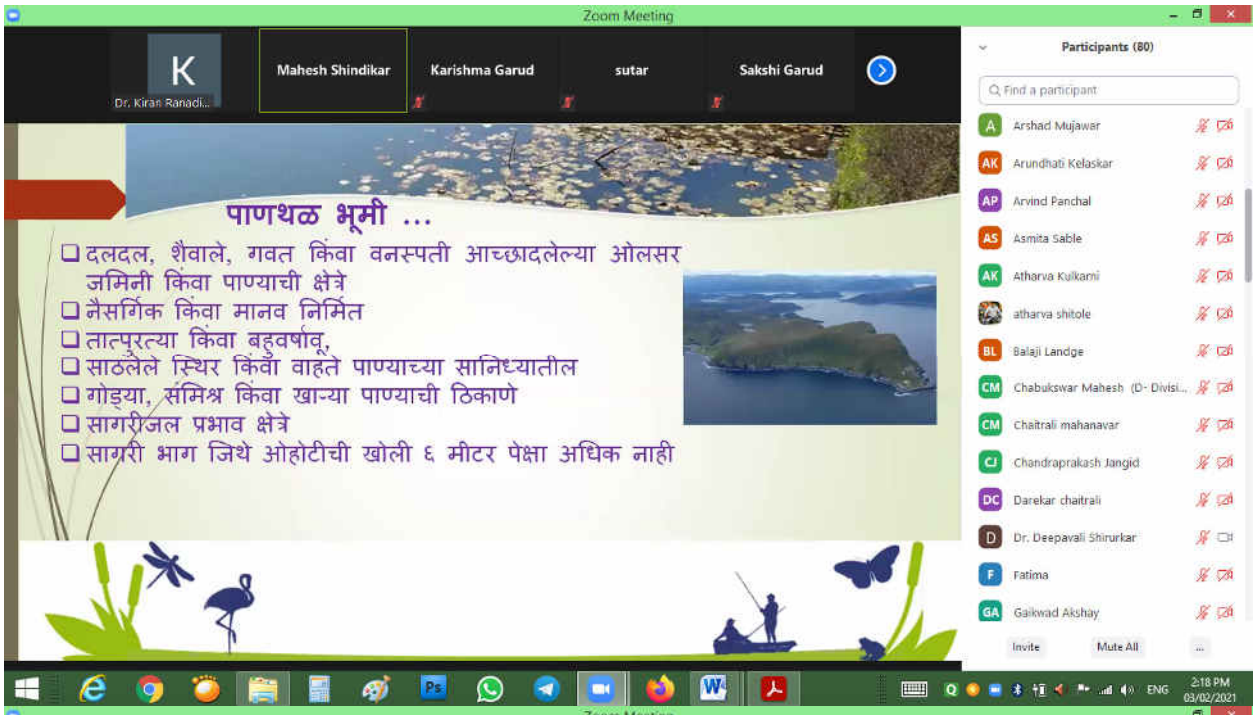
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Dr. Kiran Ranadi...
Mahesh Shindikar
Karishma Garud
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Sakshi Garud
Participants (80)
Find a participant
Arshad Mujawar
Arundhati Kelaskar
Arvind Panchal
Asmita Sable
Atharva Kulkarni
atharva shitole
Balaji Landge
Chabukswar Mahesh (D- Divisi...
Chaitrali mahanavar
Chandraprakash Jangid
Darekar chaitrali
Dr. Deepavali Shirurkar
Fatima
Gaikwad Akshay
Invite
Mute All
पाणथळ भूमी ...
दलदल, शैवाले, गवत किंवा वनस्पती आच्छादलेल्या ओलसर जमिनी किंवा पाण्याची क्षेत्रे
नैसर्गिक किंवा मानव निर्मित
तात्पुरत्या किंवा बहुवर्षावू,
साठलेले स्थिर किंवा वाहते पाण्याच्या सानिध्यातील
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सागरीजल प्रभाव क्षेत्रे
सागरी भाग जिथे ओहोटीची खोली ६ मीटर पेक्षा अधिक नाही
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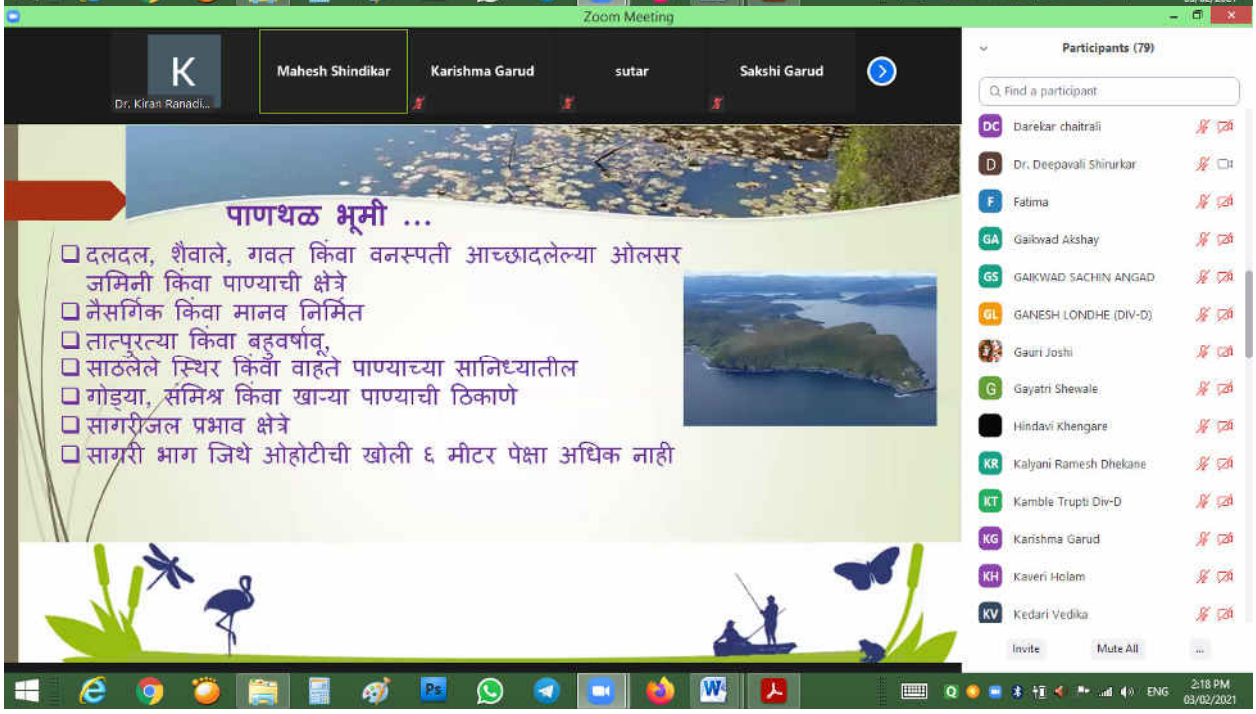
03/02/2021


Zoom Meeting
Dr. Kiran Ranadi...
Mahesh Shindikar
Karishma Garud
sutar
Sakshi Garud
Participants (79)
Find a participant
Darekar chaitrali
Dr. Deepavali Shirurkar
Fatima
Gaikwad Akshay
GAIKWAD SACHIN ANGAD
GANESH LONDHE (DIV-D)
Gauri Joshi
Gayatri Shewale
Hindavi Khengare
Kalyani Ramesh Dhekane
Kamble Trupti Div-D
Karishma Garud
Kaveri Holam
Kedari Vedika
Invite
Mute All
पाणथळ भूमी ...
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सागरी भाग जिथे ओहोटीची खोली ६ मीटर पेक्षा अधिक नाही
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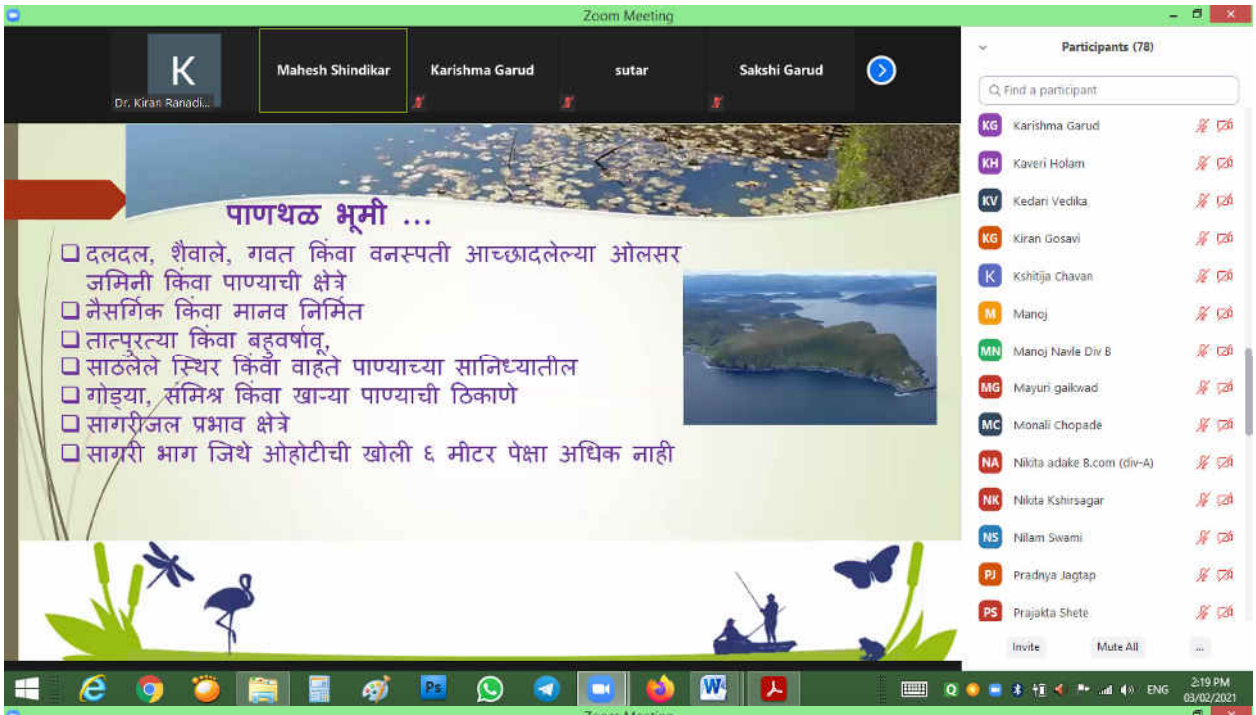
Zoom Meeting
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Mahesh Shindikar
Karishma Garud
sutar
Sakshi Garud
Participants (78)
Find a participant
Karishma Garud
Kaveri Holam
Kedari Vedika
Kiran Gosavi
Kshitija Chavan
Manoj
Manoj Navle Div B
Mayuri gaikwad
Monali Chopade
Nikita adake B.com (div-A)
Nikita Kshirsagar
Nilam Swami
Pradnya Jagtap
Prajakta Shete
Invite
Mute All
पाणथळ भूमी ...
दलदल, शैवाले, गवत किंवा वनस्पती आच्छादलेल्या ओलसर जमिनी किंवा पाण्याची क्षेत्रे
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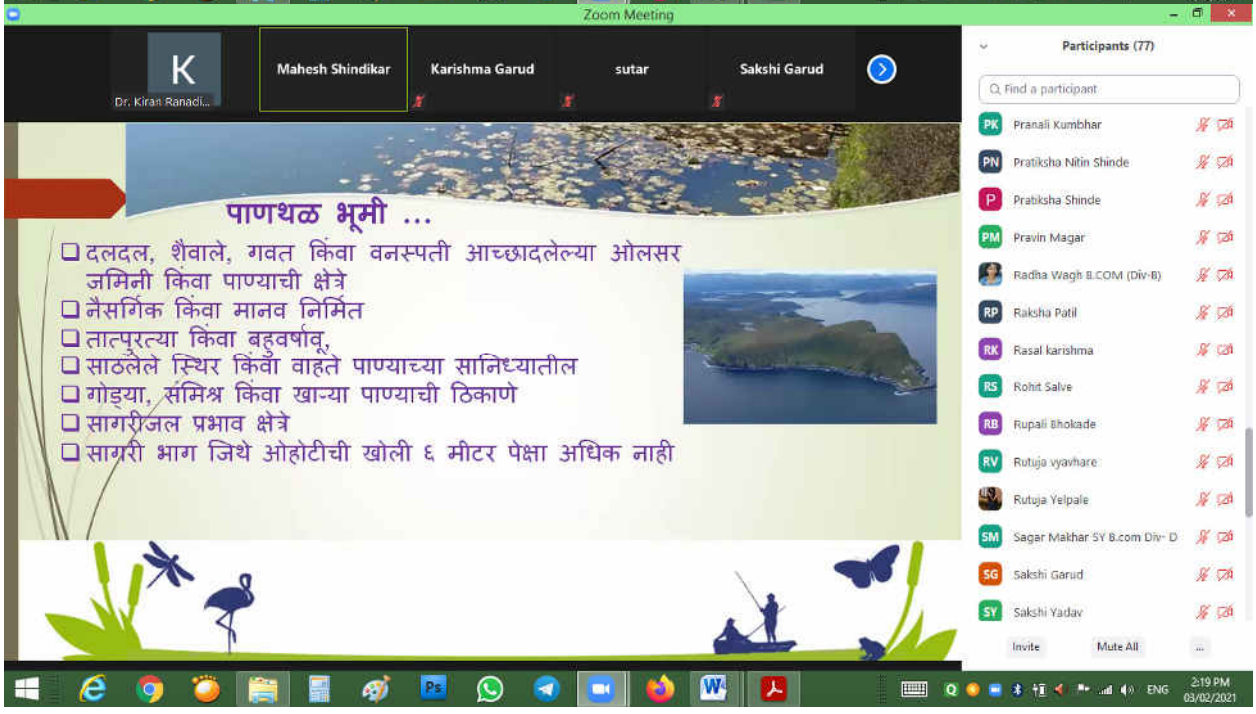
Zoom Meeting
Dr. Kiran Ranadi...
Mahesh Shindikar
Karishma Garud
sutar
Sakshi Garud
Participants (77)
Find a participant
Pranali Kumbhar
Pratiksha Nitin Shinde
Pratiksha Shinde
Pravin Magar
Radha Wagh B.COM (Div-B)
Raksha Patil
Rasal karishma
Rohit Salve
Rupali Bhokade
Rutuja vyavhare
Rutuja Yelpale
Sagar Makhar SY B.com Div- D
Sakshi Garud
Sakshi Yadav
Invite
Mute All
पाणथळ भूमी ...
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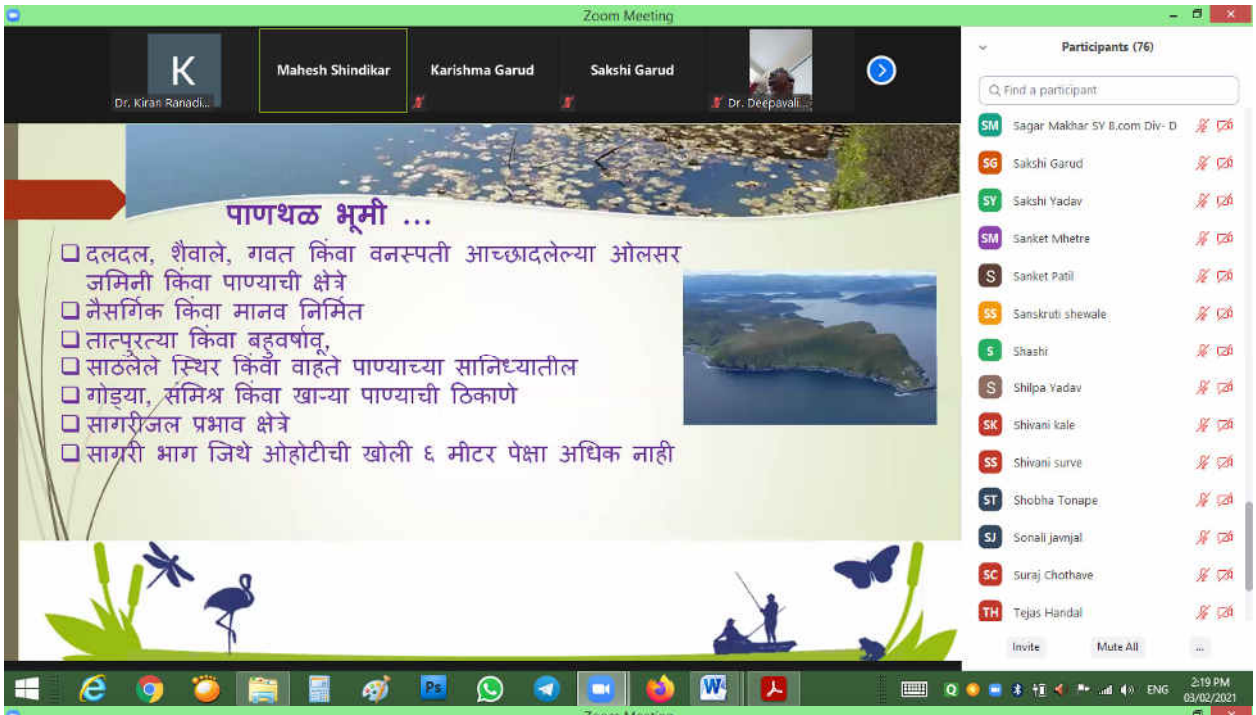
Zoom Meeting
Mahesh Shindikar
Karishma Garud
Sakshi Garud
Dr. Kiran Ranadi...
Dr. Deepavali...
Participants (76)
Find a participant
Sagar Makhar SY B.com Div- D
Sakshi Garud
Sakshi Yadav
Sanket Mhetre
Sanket Patil
Sanskruti shewale
Shashi
Shilpa Yadav
Shivani kale
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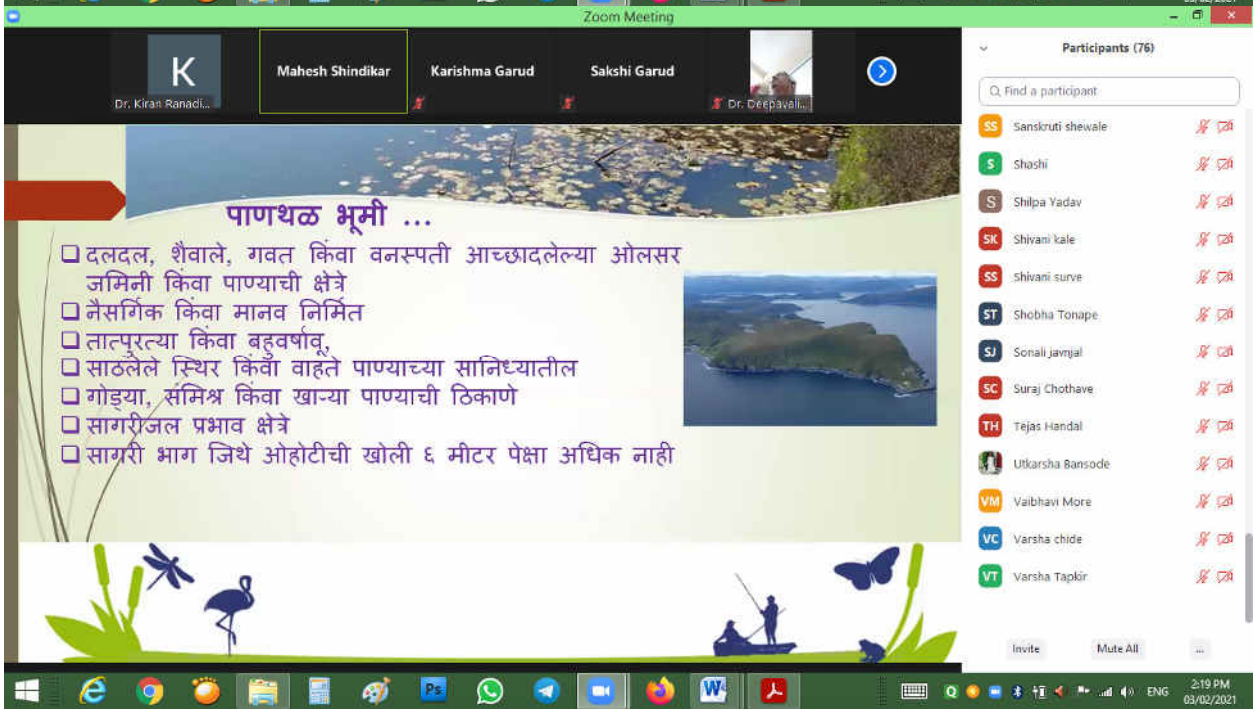
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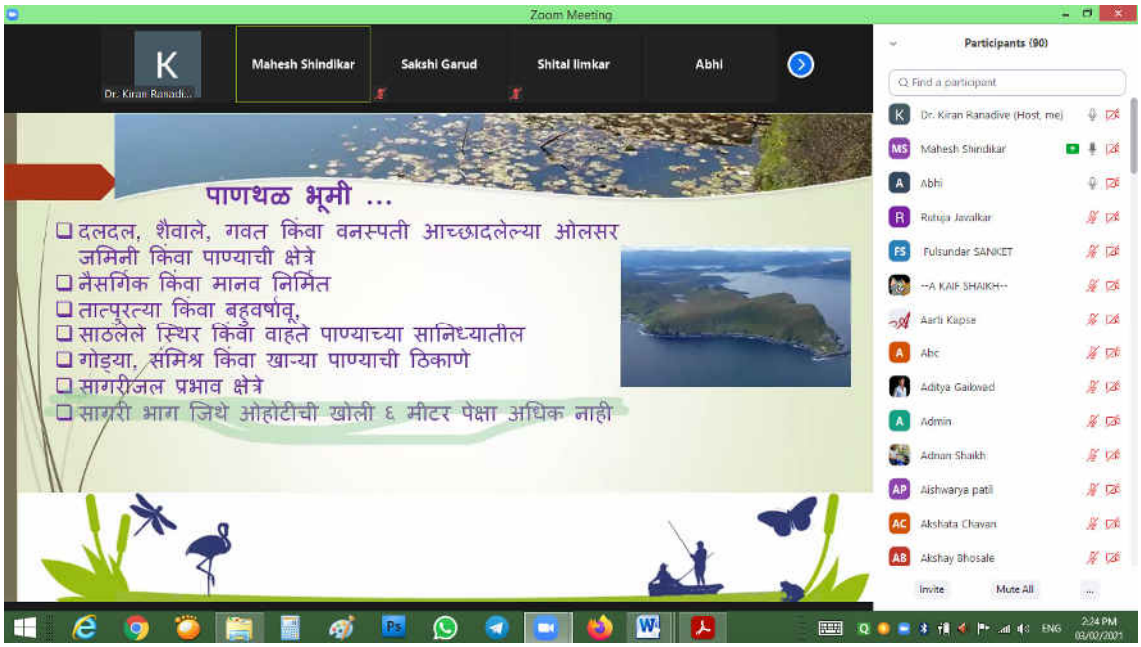

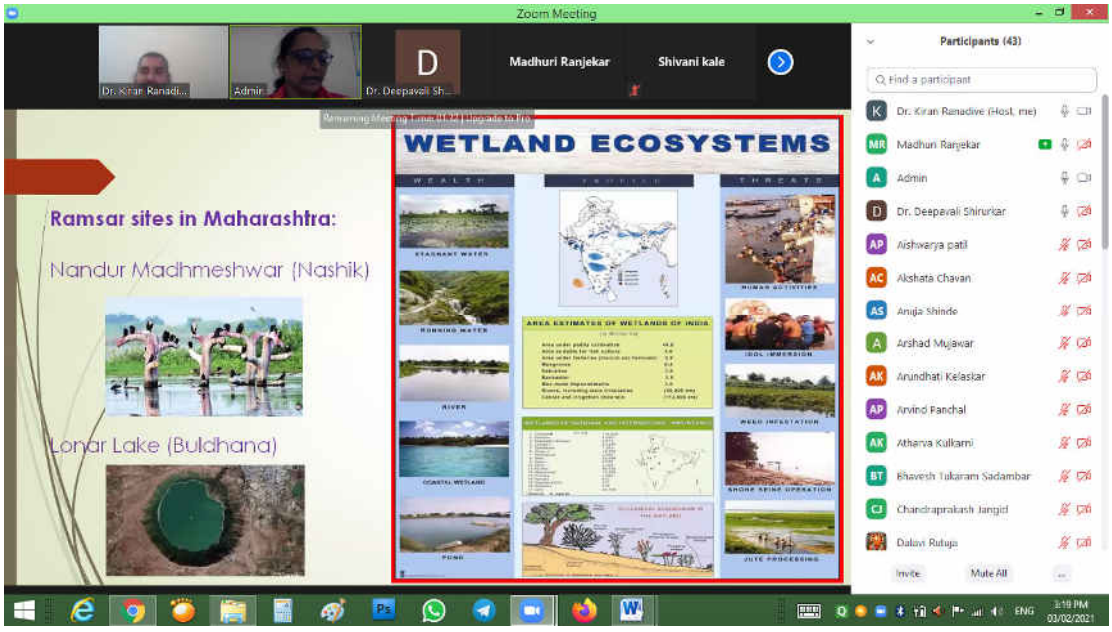

Date:- 03/02/2021

Date:- 02/02/2021

Co-ordinator
IQAC Committee
Annasaheb Magar Mahavidyalaya,
Hadapsar, Pune-28

Name & Signature of
Convener
Dr. Ranadive K. R.

Name & Signature of
HOD
Dr. Shirur Head D.
Department of Botany
Annasaheb Magar Mahavidyalaya,
Hadapsar, Pune-411028,

Pune District Education Association's

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Outward No. : AMMH / 2697/ A /2020-21 Date :

03/02/2021

To,

Dr. Mahesh Shindikar,
Associate Professor,
College of Engineering,
Pune-411005

Sub: Guest lecture

Respected Sir,

Thank you very much for accepting our invitation to deliver a lecture for undergraduate students on topic **'World Wetland Day'.** It was a great privilege and opportunity for us to have your expertise on the topic. We are indebted to you for imparting with your knowledge and information and look forward for such generosity from you in future as well.

Thanking you,

Dr. D. D. Shirurkar
Head

Dr. Pandit Shelke
Principal
PRINCIPAL
Annasaheb Magar Mahavidyalaya,
Hadapsar, Pune-411028.

Pune District Education Association's

ANNASAHEB MAGAR MAHAVIDYALAYA

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Outward No. : AMMH / 2676 A/2020-21 Date :

03/02/2021

To,

Dr. Mahesh Shindikar,
Associate Professor,
College of Engineering,
Pune411005

Sub:- Guest lecture

Respected /Sir,

We feel extremely glad to invite you to deliver guest lecture for Undergraduate students on topic **'World Wetland Day' on 03/02/2021** to introduce the importance of Wetlands amongst the students.

Thanking you,

Dr. D. D. Shirurkar
Head

25/2/2021
Dr. Pindit Shelke
Principal
PRINCIPAL
Annasaheb Magar Mahavidyalaya,
Hadapsar, Pune-411028.

Pune District Education Association's
ANNASAHEB MAGAR MAHAVIDYALAYA
Hadapsar, Pune – 411 028

Students Projects

A

PROJECT REPORT ON

Electrochemical deposition of nickel graphene composite coatings: effect of deposition temperature on its surface morphology and corrosion resistance

MASTER OF SCIENCE

IN PHYSICS

ANNASAHEB MAGAR COLLEGE, HADAPSAR

- Name - ABHIJEET PATANGRAO MORE
- Submitted to - Dr. R.U.MENE SIR

CERTIFICATE

This is to certify that, ABHIJEET PATANGRAO MORE
MSC (Physics), Semister IV has satisfactorily completed the project titled "Electrochemical deposition of nickel graphene composite coatings: effect of deposition temperature on its surface morphology and corrosion resistance" for partial completion of
M.Sc. (Physics) master degree of
ANNASAHEB MAGAR COLLEG during the year - 2020-2021.

Prof. Dr. R.U. MENE SIR
(Project Guide)

Prof. Dr. R.P. JOSHI
(HEAD OF DEPARTMENT)

ACKNOWLEDGEMENT

I wish to thank the Principal sir of my college for permitting me to use all facilities available in the institution for my project work. I would also like to thank the Head, department of Physics Prof. Dr. Joshi sir, for allowing facilities available in the department, also thank to the teaching faculties and all the non – teaching staff of my college for their support in completing the work successfully.

I am grateful to my guide Prof. Dr. Mene sir for his encouragement, guidance and supervision of my project work "Electrochemical deposition of nickel graphene composite coatings: effect of deposition temperature on its surface morphology and corrosion resistance" during the year.

I am also thankful to the all teaching staff, lab assistance, non teaching staff and my friends have been of a great help to me during the project work who were not directly but indirectly involved in my project.

NAME – ABHIJEET PATANGRAO MORE
M.Sc –II (PHYSICS)

INDEX

Chapter 3 Characterization

3.1 Characterization technique

3.1.1 A scanning electron microscope

3.1.2 X ray diffraction

3.1.3 EDAX

3.1.4 Atomic force microscopy

3.2 A characterization of graphene

3.2.1 A scanning electron microscope of graphene

3.2.2 X ray diffraction

3.2.3 Raman spectra of grapheme oxide

3.2.4 Effects of deposition temperature of surface morphology and carbon content in composite coating

3.2.5 Roughness of composite coating

3.2.6 Presence of different elements in prepared composite coating

3.2.7 Thickness of composite coating

3.2.8 Grain size and micro hardness of deposited coating

What are Nanomaterials?

Nanomaterials can be defined as materials possessing, at minimum, one external dimension measuring 1-100nm. The definition given by the European Commission states that the particle size of at least half of the particles in the number size distribution must measure 100nm or below.

Nanomaterials can occur naturally, be created as the by-products of combustion reactions, or be produced purposefully through engineering to perform a specialized function. These materials can have different physical and chemical properties to their bulk-form counterparts.

How do nanoparticles differ from their bulk material?

The material properties of nanostructures are different from the bulk due to the high surface area over volume ratio and possible appearance of quantum effects at the nanoscale. The study of size and shape effects on material properties has attracted enormous attention due to their scientific and industrial importance.

Uses of nanomaterial

Nanotechnology can be used to design pharmaceuticals that can target specific organs or cells in the body such as cancer cells, and enhance the effectiveness of therapy.

Nanomaterials can also be added to cement, cloth and other materials to make them stronger and yet lighter.

Their size makes them extremely useful in electronics, and they can also be used in environmental remediation or clean-up to bind with and neutralize toxins.

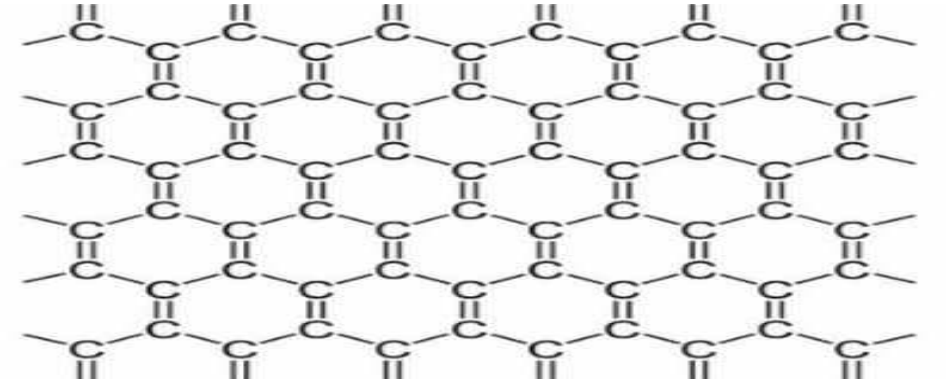
What is graphene ?

Graphene is a single layer (monolayer) of carbon atoms, tightly bound in a hexagonal honeycomb lattice. It is an allotrope of carbon in the form of a plane of sp2-bonded atoms with a molecular bond length of 0.142 nanometres. Layers of graphene stacked on top of each other form graphite, with an interplanar spacing of 0.335 nanometres. The separate layers of graphene in graphite are held together by van der Waals forces, which can be overcome during exfoliation of graphene from graphite.

Initially, the only method of making large-area graphene was a very expensive and complex process (of chemical vapour deposition ,CVD) that involved the use of toxic chemicals to grow graphene as a monolayer by

exposing Platinum, Nickel or Titanium Carbide to ethylene or benzene at high temperatures. There were no alternatives of using crystalline epitaxy on anything other than a metallic substrate. These production issues made graphene initially unavailable for developmental research and commercial uses. Also, using the CVD graphene in electronics was hindered by the difficulty of removing the graphene layers from the metallic substrate without damaging the graphene.

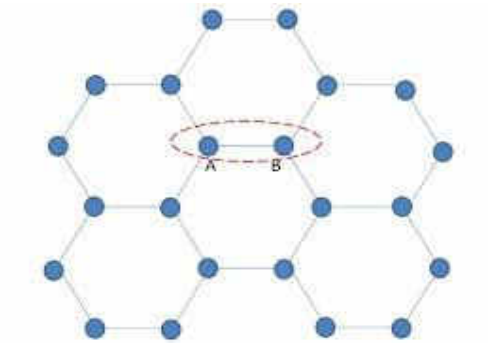
Structure of graphene



Molecular structure of graphene

Combined graphite in single layers that measure just one atom thick is called graphene; each of these molecules displays a full planar shape while a single graphene sheet is considered to be one molecule. Due to the strength and durability of covalent bonds amid carbon atoms, graphene has increased tensile power –tensile which presents the capacity of how much one can stretch something before it

ruptures. Moreover, unlike nanotube or buckyball, graphene has no volume since it is flat and leveled Nanotubes as well as buckyballs (Buckministerfullerene)all have their atoms settled on the surface allowing these to only interact with molecules that surround them. As for graphene, all of its atoms are also on the surface but can be easily accessed from both ides, allowing are interaction between the molecules that around it. Amazingly, graphene can easily repair holes accumulated in it sheet when being exposed to molecules that are incorporated into carbon like hydrocarbon .Infused with pure and authentic carbon atoms, these atoms align and coordinate perfectly into hexagonal patterns until all the holes are completely filled.



crystal structure of graphene

Graphene is a one –atom thick structure of sp2-bonded carbon atoms. These carbon atoms are densely packed in a honeycomb crystal lattice structure .Since the detection in 2004, graphene has attracted fabulous research interest in energy-storage technologies due to its unusual properties ,like great mechanical strength , large specific surface area and high electrical conductivity. Now days a lot of research has been launched into the development of Graphene-based Nano composites that consist of Graphene and transition-metal oxides such as Mno_2, Zno, Nio, Co_3O_4 because they combine the advantages of both components and may offer special properties through the reinforcement or modification of each other.

Properties of graphene

Molecular Formula	C140H42O20
Molar Mass	2043.8g/mol
Appearance	Black Solid
Density	2.267g/cm3
Melting Point	4510k
Boiling Point	4200 k
Electron negativity	2.55 Pauling's
Heat of fusion	117KJ/mol

Graphene possesses other amazing characteristics: Its high electron mobility is 100x faster than silicon; it conducts heat 2x better than diamond; its electrical conductivity is 13x better than copper; it absorbs only 2.3% of reflecting light; it is impervious so that even the smallest atom (helium) can't pass through a defect-free monolayer graphene sheet; and its high surface area of 2630 square meters per gram means that with less than 3 grams you could cover an entire soccer field (well, practically speaking you would need 6 grams, since 2630 m2/g is the surface area for both sides of a graphene sheet). Graphene is the basic building block for other graphitic materials; it also represents a conceptually new class of materials that are only one atom thick, so-called two-dimensional (2D) materials (they are called 2D because they extends in only two dimensions: length and width; as the material is only one atom thick, the third dimension, height, is considered to be zero).The extraordinary characteristics of graphene originate from the 2p orbital, which form the π state bands that delocalize over the sheet of carbons that constitute graphene.

Graphene has emerged as one of the most promising nanomaterial because of its unique combination of superb properties: it is not only one of the thinnest but also strongest materials; it conducts heat better than all other materials; it is a great conductor of electricity; it is optically transparent, yet so dense that it is impermeable to gases – not even helium, the smallest gas atom, can pass through

Application of graphene

Graphene has a lot of promise for additional applications

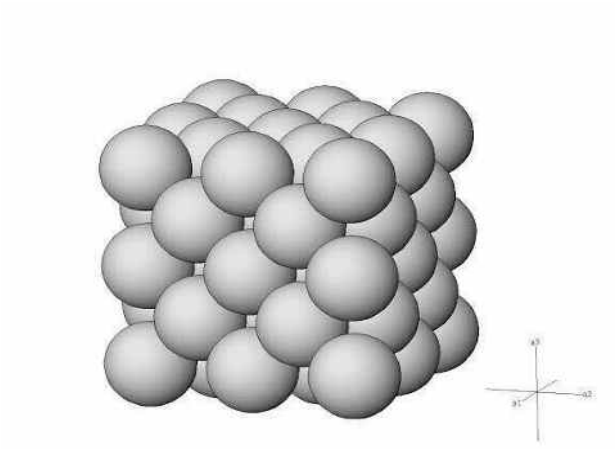
1. anti-corrosion coatings and paints,
2. Efficient and precise sensors
3. faster and efficient electronics
4. flexible displays, 5.efficient solar panels
6. , drug delivery,.
7. DNA sequencing

What is nickel ?

Nickel is a chemical element with the symbol Ni and atomic number 28. It is a silvery-white lustrous metal with a slight golden tinge. Nickel belongs to the transition metals and is hard and ductile. Pure nickel, powdered to maximize the reactive surface area, shows a significant chemical activity, but larger pieces are slow to react with air under standard conditions because an oxide layer forms on the surface and prevents further corrosion (passivation). Even so, pure native nickel is found in Earth's crust only in tiny amounts, usually in ultramafic rocks,[4][5] and in the interiors of larger nickel–iron meteorites that were not exposed to oxygen when outside Earth's atmosphere. Use of nickel (as a natural meteoric nickel–iron alloy) has been traced as far back as 3500 BCE. Nickel was first isolated and classified as a chemical element in 1751 by Axel Fredrik Cronstedt, who initially mistook the ore for a copper mineral, in the cobalt mines

of Los, Halsingland, Sweden. The element's name comes from a mischievous sprite of German miner mythology, Nickel (similar to Old Nick), who personified the fact that copper-nickel ores resisted refinement into copper. An economically important source of nickel is the iron ore limonite, which often contains 1–2% nickel. Nickel's other important ore minerals include pentlandite and a mixture of Ni-rich natural silicates known as garnierite. Major production sites include the Sudburyregion in Canada (which is thought to be of meteoric origin), New Caledonia in the Pacific, and Norilsk in Russia.

Structure of nickel



Nickel is a metal in group VIII of the periodic table with atomic number 29, an atomic weight of 58.71, and a density of 8.9. ... At room temperature the crystal structure is face-centered-cubic with a basis of one Ni atom. c, as found both by X-ray and electron diffraction methods. The new structure turns out to be hexagonal, the values of the

axes being c = 4·06 A., a = 2·474 A. ratio 1·64, which is near enough to the ratio 1·633 for closest pack

Properties of nickel

Molecular Formula	Ni+2
Molar Mass	58.69g/mol
Appearance	Lustrous, metallic
Density	8.9g/cm3
Melting Point	1728k
Boiling Point	3005 k
Electronnegativity	1.91 Pauling's
Heat of fusion	17.47 KJ/mol

It is hard, malleable, ductile and to an extent ferromagnetic (up to 360 °C). It has a fair electrical conductivity (25% that of copper) and heat conductivity. It belongs to the iron-cobalt group of metals. Nickel is highly resistant to atmospheric corrosion and resists most acids, but is attacked by oxidizing acids such as nitric acid.

Natural nickel is a mixture of five stable isotopes, while nine other unstable isotopes are known.

Nickel carbonyl is considered highly toxic and exposure should be very limited. The fumes and dust of nickel sulfide are recognized as having carcinogenic potential.

Owing to its high resistance to corrosion in water or air, pure nickel is used as a protective coating. While it is unaffected by alkalis, it is readily soluble in dilute acids. When it comes to applications, nickel is used as a constituent of different types of alloys; for instance, Monel (corrosion resistant material), Ni-chrome (an alloy used for resistance heating elements), Perm alloy (an alloy with high magnetic permeability at low field strength and low hysteresis loss), cupronickel, stainless steel, nickel silver, etc.

Properties of nickel

- The most crucial use of this element is that it is used to make coins.
- It is used in making wires.
- It is used in gas turbines and rocket engines as it has the capability to resist corrosion even at high temperature.
- It is used to make a variety of alloys which are further used to make armour plating, nails, or pipes.
- Monel (alloys of nickel and copper), is a hard compound and can resist corrosion by seawater.

Hence, it is used in propeller shaft in boats and desalination plants.

Methods of nanocomposition

A nanocomposite is as a multiphase solid material where one of the phase has one , two or three dimensions of less than 100nm.

The Nanocomposite preparations methods are as follows :

- Electro spinning method
- Sol-gel method
- Chemical Bath deposition
- Hydrothermal method
- Dip coating method

Chapter 2

EXPERIMENTATION AND CHARTERIZATION

2.1 Synthesis of Graphene

The graphene oxide was synthesized by improved Hummer's method, chemical exfoliation of graphite flakes that is general approach to prepare graphene oxide, briefly 1 g graphite flakes and 6 g $KMnO_4$ were added into the mixture of concentrated acids of 180 ml H_2SO_4 and 20 ml

H3PO4, which produced a slight exothermic reaction at 35 to 40 C. The reaction was shifted to 50C and stirred for 12 hours. Then the reaction was kept for cooling at room temperature and 400 ml ice water along with the 30% H2O2 (3 ml) were added. The obtained mixtures were saved for 24 hours. The supernatants were decanted away from the suspension by centrifugation (8000 rpm for 5 hour), aper repeatedly washing, the obtained materials was shifted into the glass plate and dried it for 24 hours at 60 C in vacuum, solid product GO was obtained. Further, graphene oxide was reduced into graphene by chemically reduction method through using hydrazine hydrate as a reducing agent

Electrodeposting process

Electrodeposition is an electrochemical process that allows the preparation of solid deposits on the surface of conductive materials. It is a commercially highly relevant process, providing the basis for many industrial applications, such as electro-winning, refining, and metal plating. Metal plating is the process that has perhaps the closest contact with most people's everyday life, because we are surrounded by things that have a protective or decorative coating, such as watches, buttons, belt buckles, doorknobs, handlebars, etc. Additionally and more recently, as will be seen below, not only do the circuit boards and the packaging modules of computers, but also the recording and reading heads of their hard disk drives

and the microprocessor chip itself may have plated material on them. Electrodeposits are formed by the action of an electric current passing in an electrochemical cell, a device that consists of two conductive or semi-conducting electrodes immersed in an electrolyte. The electrodes are called the working electrode (cathode), consisting of the object where electrodeposition is planned, and the counter-electrode (anode), necessary to complete the electrical circuit. Electrolytes for electrodeposition are usually aqueous solutions containing positive and negative ions, prepared by dissolving metal salts. The electric current that flows between the two conductive electrodes in the presence of an external voltage is because of the motion of charged species, via migration and diffusion, towards the surfaces of the polarized electrodes. At the surface of the electrodes, the conduction mechanism must change from ionic to electronic, an interface process mediated by the occurrence of electrochemical reactions that promote the reduction or the oxidation (redox reactions) of the ionic species.

Advantage of electrodepostion

Corrosion resistance: a corrosion-prone substance such as iron can be coated with a layer of non-corrosive material, thereby protecting the original material.

Decorative items: shine and luster can be imparted to otherwise dull surfaces. This makes for great decorative items.

Cheaper ornaments: instead of making ornaments out of gold or silver, one can make them using cheaper metals and electroplate the ornaments with gold. This reduces the cost of ornaments greatly.

improving mechanical characteristics: electroplating can also improve the mechanical characteristics of metals.

USES OF ELECTROPLATING

1. Electroplating uses in Aesthetics.
2. Electroplating uses in Commercial application.
3. Electroplating use to prevent corrosion.
4. Electroplating helps in conduction of Electricity.
5. Electroplating to reduce friction.
6. Electroplating helps to protect from radiation.

Chapter 3

Charecterization

Electrodeposition process for preparation of graphene nickel composite coating

The electrodeposition process was performed to prepare the Ni– graphene composite coatings. The samples of carbon steel grade Q235 with size of 10, 20, 2 mm was used as substrate The size of sample mainly used for coating is 20,10, 2 mm this size was used for various testing of electrochemical and mechanical properties of composite coatings. The bath composition is shown in the Table 2, the parameters and conditions for electrodeposition were as; current density was 5 A dm 2, 0.2 g L graphene concentration in the conventional Watts bath solution, pH value was adjusted to 3–4, one hour ultrasonication for better dispersion of graphene nanosheets, stirring speed was 400 rpm and deposition time was one hour.

The properties of composite coatings were characterized at different deposition temperatures (15 C, 30 C, 45 C and 60 C, respectively).

Prior to electrodeposition, the samples were prepared by grinding with different grades of emery papers (240 , 320,600 and 1200, respectively) to obtain smooth, bright and uniform surfaces, then cleaning with different chemicals (10%HCL and 5% H2SO4) was performed to remove the surface impurities, dust, oil and oxides layer. The experimental setup contains two anode plates of

nickel in size 70 mm, 40 mm, 1mm placed in the both ends of bath solution, carbon steel as a cathode adjusted between both and plates. Surface, sodium do decal sulfate (SDS) was used for reasonably good dispersion of graphene sheets owing to the SDS adsorption on the graphene sheets, which cause the electrostatic repletion between graphene layer and traditional setup of three electrodes cell. The saturated calomel electrode (SCE) was as reference electrode, platinum(Pt) as auxiliary electrode, composite □lm on carbon steel was encapsulated and exposed area of about l cm2 as a working electrode. The polarization curves of coatings were performing 3.5% NaCl solution. The scanning starts potential 0.3 mV(relative to the open circuit potential), 0.5 V (set to end potential),and scanning rate is l mV s1. Electrochemical impedance spectroscopy (EIS) of composite coating was performed. The deposited samples were immersed in 3.5% NaCl solution to stabilize the open-circuit potential and the test frequency range of 0.01 Hz to 100 kHz with 10 mV AC potential signal varied from open potential

Characterization technique

A Scanning electron microscope

A scanning electron microscope (SEM) scans a focused electron beam over a surface to create an image.

The electrons in the beam interact with the sample, producing various signals that can be used to obtain information about the surface topography and composition

X –Ray diffraction

X-ray diffraction analysis (XRD) is a technique used in materials science to determine the crystallographic structure of a material. XRD works by irradiating a material with incident X-rays and then measuring the intensities and scattering angles of the X-rays that leave the material [

. EDAX

Energy Dispersive X-Ray Analysis (EDX), referred to as EDS or EDAX, is an x-ray technique used to identify the elemental composition of materials. Applications include materials and product research, troubleshooting, de formulation, and more.

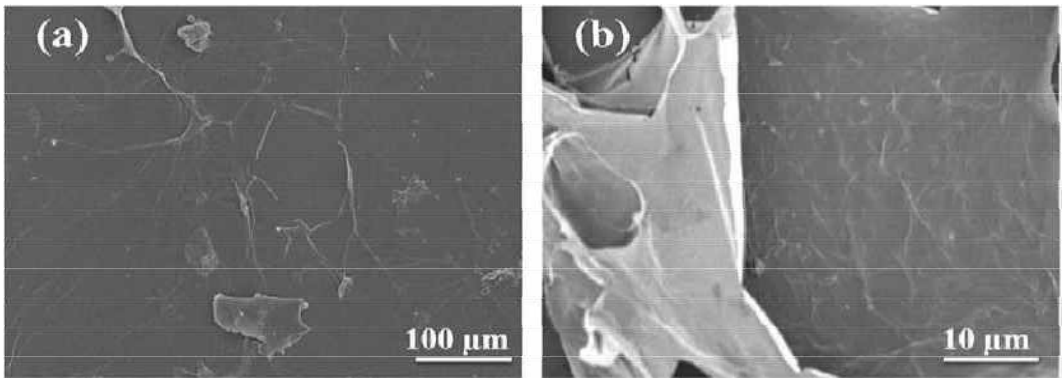
Atomic force microscopy

Atomic force microscopy (AFM) is a type of scanning probe microscopy (SPM), with demonstrated resolution on the order of fractions of a nanometer, more than 1000 times better than the optical diffraction limit. The information is gathered by "feeling" or "touching" the

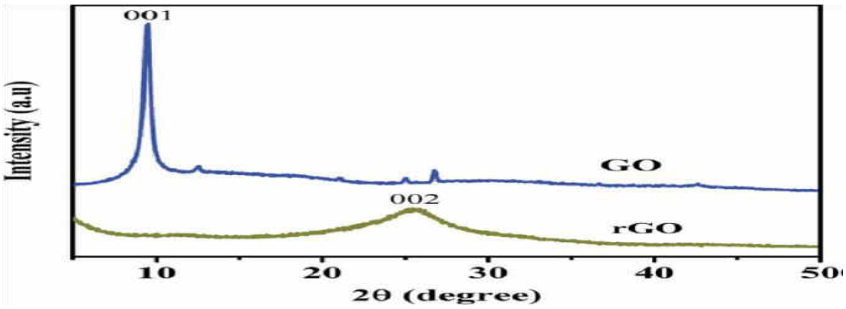
surface with a mechanical probe. Piezoelectric elements that scanning facilitate tiny but accurate and precise movements on (electronic) command enable precise.

A Scanning electron microscope of graphene

The SEM micrographs of Graphene synthesized by a modified Hummers processing Figures clearly shows that the Graphene has a two-dimensional sheet-like structure. From the SEM images, it is evident that Graphene has a multiple lamellar layer structure and it is possible to distinguish the edges of individual sheets from the SEM images. The films are stacked one above the other and also show wrinkled areas. Lamellar structures having a length of up to 1.29 mm and width of 239 μm could be seen in the SEM images. The individual Graphene sheets were found to have a thickness of 1 - 2 μm and are found to be much larger than the thickness of single layer graphene. The increase in the thickness is due to the introduction of the oxygen-containing functional groups. It can also be noted that the Graphene sheets were thicker at the edges. This is because the oxygen-con- training functional groups were mainly combined at the edges of GO. From the SEM images, it is evident that the Graphene sheets were firmly suspended and did not bend.



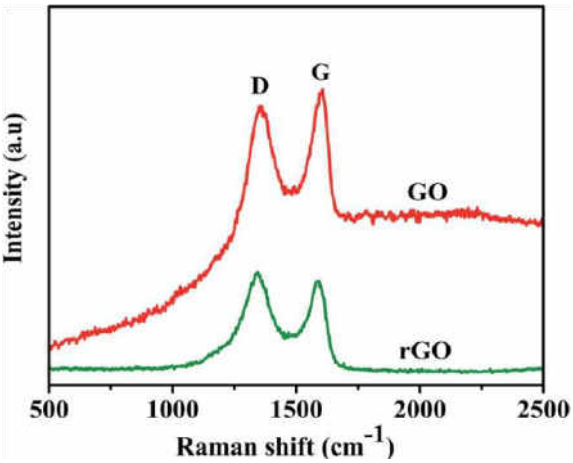
X –ray diffraction



Characteristics of carbon peak (001) for GO sheets observed at 10_ corresponding to spacing or inter layer distance of 0.8 nm similar reported by Marciano and coworker.46 A er reduction, (001) disappeared

and the new peak (002) was observed at 2q ¼ 25.4_ corresponding to the spacing of about 0.4 nm consistent with thereported,48 which is in good arrangement of interlayer distance of graphene.

Raman spectra of graphene oxide



The Raman spectra of graphene shows the appearance of D peaks at 1350 cm_1and G peaks at _1590 cm_1 ensure the conation of lattice distortions.47 The ratios of ID/IG peak intensity are about 0.8 and 0.9 for graphene oxide and reduced graphene oxide, respectively, showing the reduction in average size of sp2 domains and edge defects owing to the reduction of some C]C bonds in graphene oxide

Effect of deposition temperature on the surface morphology and carbon content in composite coatings

The prepared composite coatings for this study possess good adhesion and stability to the substrate. Fig. 1 shows the surface morphologies of coatings deposited at different temperatures15 C, 30 C, 45C and 60 C, respectively, from the bath containing0.2 g L graphene sheets. It is undoubtedly understanding that the deposition temperature has significant effect on the surface

morphologies of nickel graphene composite coatings. The composite coatings become coarser, compact and the spherical morphologies was obtained when the deposition temperature increased from 15 C to 45C . Further increases the deposition temperature, compactness of obtained coatings declined and degradation started. The reason may have expected that when the deposition temperature increased to 60 C, some voids and crack appeared on the surface of the deposited coatings.
Fig. 1 reveals that the coarseness of composite coatings increased as the deposition temperature increase to peak value45 _C and with further increase of temperature to 60 _C, the surface roughness was not increased. The SEM micrographs shows the increasing trend in uniformly distribution of grapheme sheets and the substrate was well deposited and fully covered with coatings without any surface cracks when the deposition temperature increases to 45 _C. The other reason is expected that the shape of grains growth and phase structure actually, the coatings comprised of two types of spherical and like structures, which were increased as deposition temperature increases to peak value 45 _C, but at higher deposition temperature the coatings shows structure. In the Fig. 1(e–f) shows the bulges morphologies and incorporations of graphene layers into nickel matrix of composite coatings shown, white arrows show the graphene layers and black arrows indicate the bulges shapes formation of Ni–graphene composite in (Fig. 1e). Where in the (Fig. 1f) image, selected area represent the graphene sheets layers incorporated into the nickel matrix and arrows express the

graphene rich bulges morphology formation during the co deposition of nickel–grapheme composite coating.

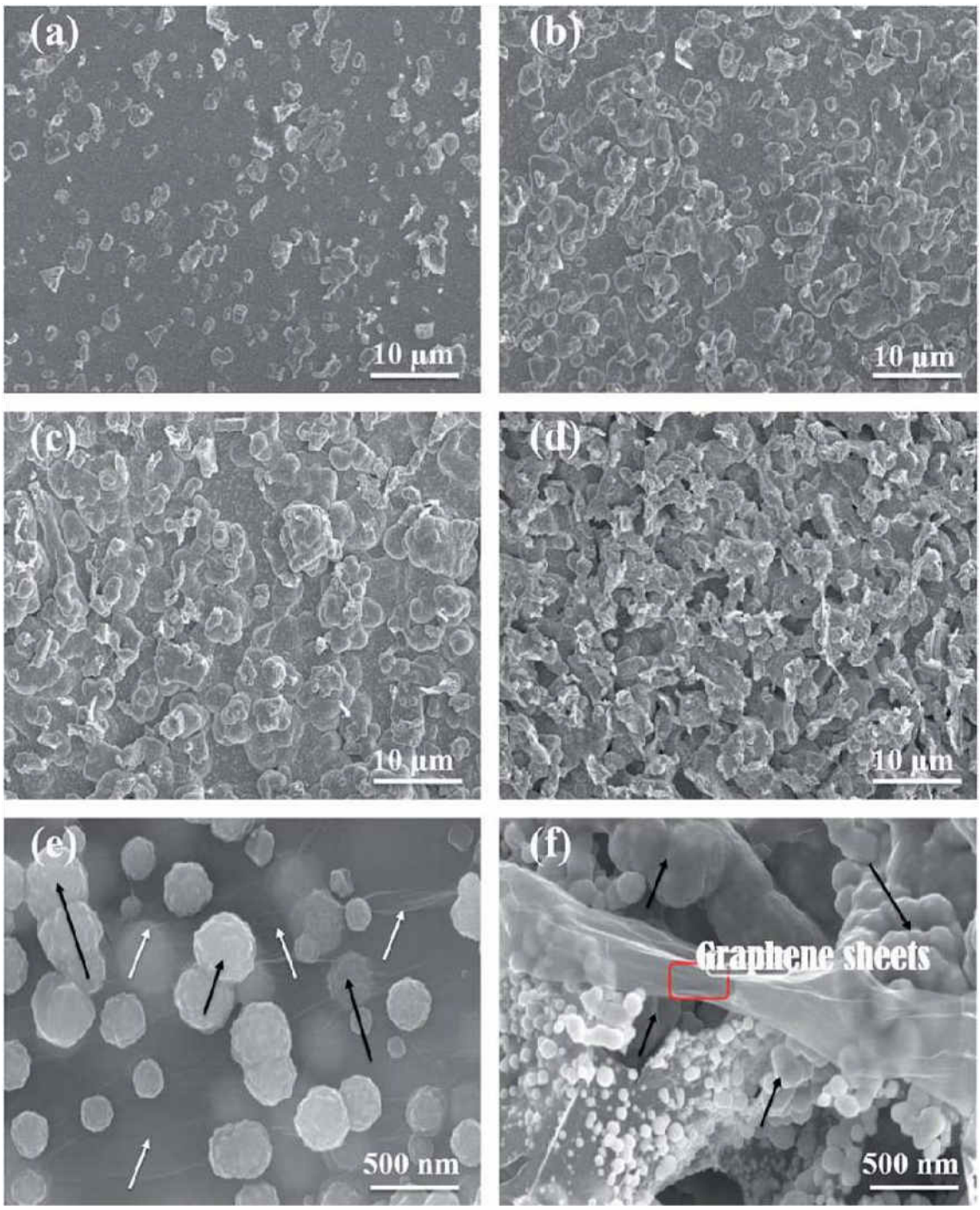


Fig.1 SEM images: (a–d) for the surface morphologies of Ni–graphene composite coatings prepared at deposition temperatures

(15 C, 30 C, 45 C and 60 C, respectively). (e) Composite coating with white arrows shows the graphene layers and black arrows indicates the bulges shapes formation of Ni–graphene composite. (f) The selected area represent the graphene sheets layers incorporated in the nickel matrix of composite coating and arrows express the graphene rich bulges morphology in composite coating.

Roughness of composite coating

Surface roughness of the composite coating was measured by the atomic force microscopy (AFM) shown as in Table and surface roughness morphologies are given in Fig. ,which indicates that roughness of coating increases with increasing the deposition temperature and this remains almost same with further increasing of bath temperature after 45 C. The reason is expected due to the not increasing of carbon content in the composite coating aper peak deposition temperature of 45 C.

Surface roughness of composite coating deposited at different bath temperatures

Deposition temprature	Average roughness (Ra) (nm)	Root mean square roughness (Rq) (nm)
15	34.2	47.7
30	91.1	113
45	128	119
60	151	184

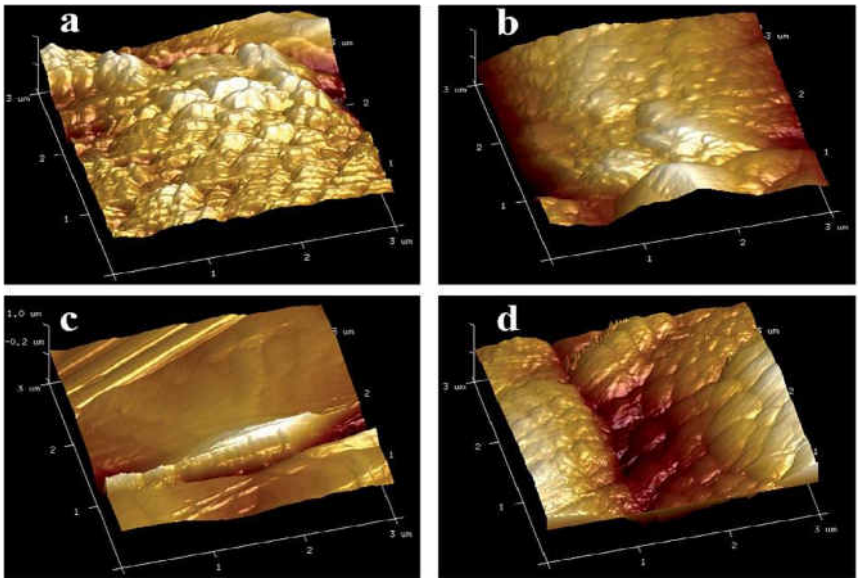


Fig. AFM images (a–d) showing the surface roughness of Ni–graphene composite coatings prepared at deposition temperatures (15 C, 30 C,45 C and 60 C, respectively).

presence of different elements in the prepared composite coatings

Energy dispersive spectroscopy (EDS) analysis was applied to confirm the presence of different elements in the prepared composite coatings. Fig. 6 shows EDS spectra and results of compositional analysis for Ni–graphene composite coatings obtained at different bath temperatures. The EDS results of coatings show the presence of Ni and C which ensure the incorporation of graphene in the nickel matrix during deposition process. The results of EDS illustrate the carbon contents incorporated in the composite coatings during

electrodeposition at different temperatures, the carbon contents increases as the bath temperature increase to peak value 45 C. It is expected that enough reduction of Ni ions which increases the possibility of captured grapheme nano sheets into the nickel matrix because the graphene is more conductive and nickel ions likely to adsorbed on the grapheme nano sheets result in forming the carbon content enriched bulges on the surface of composite coatings. On the other hand, carbon contents were decreased at high temperature 60 _C. The reason is may be the rapidly moving nickel ions dissolved from the anode bar and there is not enough time for nickel ions to adsorb at graphene nanosheets, and agglomeration effect
of graphene also dominated at high temperature which caused lower carbon contents incorporation in the composite coatings.

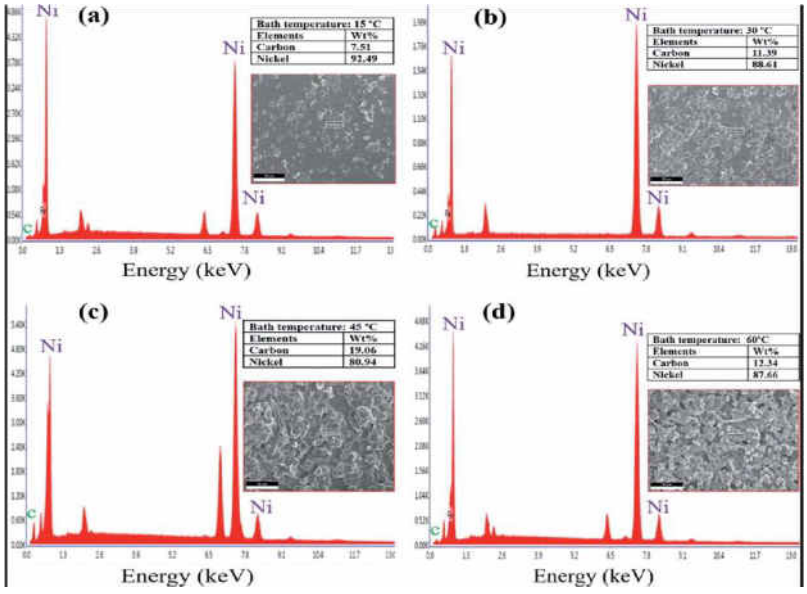
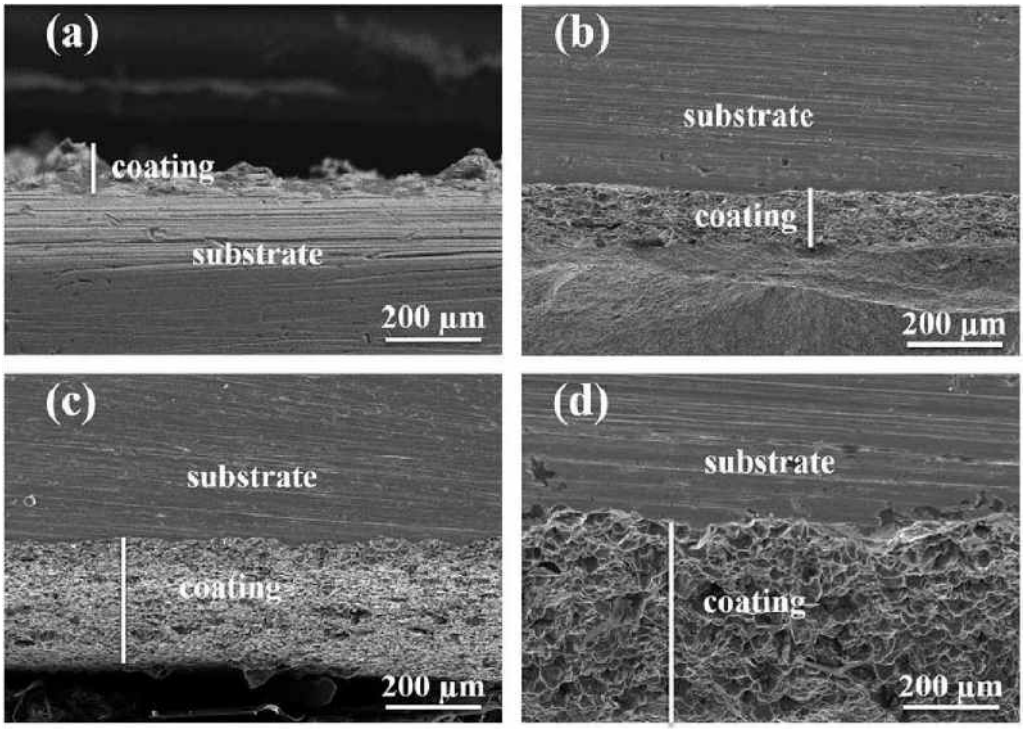


Fig. EDS results show the effect of different bath temperatures on composition of coatings.

Cross section of coating

SEM was used to observe the cross section of coating; cross sectional photographs are shown in fig



Cross sectional photographs of the composite coating deposited at different deposition temperatures ((a)15 C, (b) 30 C, (c) 45 C and (d) 60 C).

Thickness of composite coating

Thickness was measured to study the effect of electrochemical deposition temperature on the thickness of Ni–graphene composite coating .down Fig. 8 shows the influence of bath temperature on the thickness of composite coating. It was found that the thickness was increased with the increases of deposition temperature

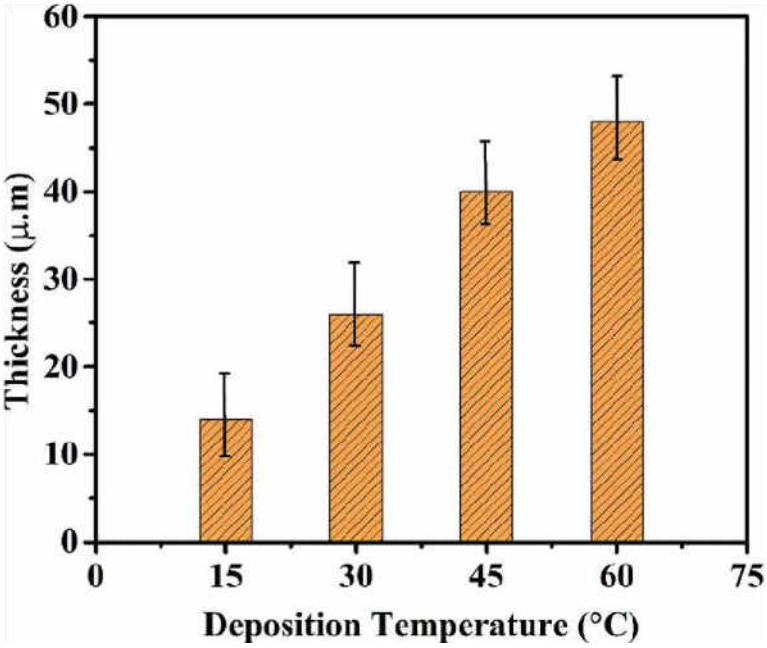


Fig. Effect of bath temperature on the thickness of composite coating.

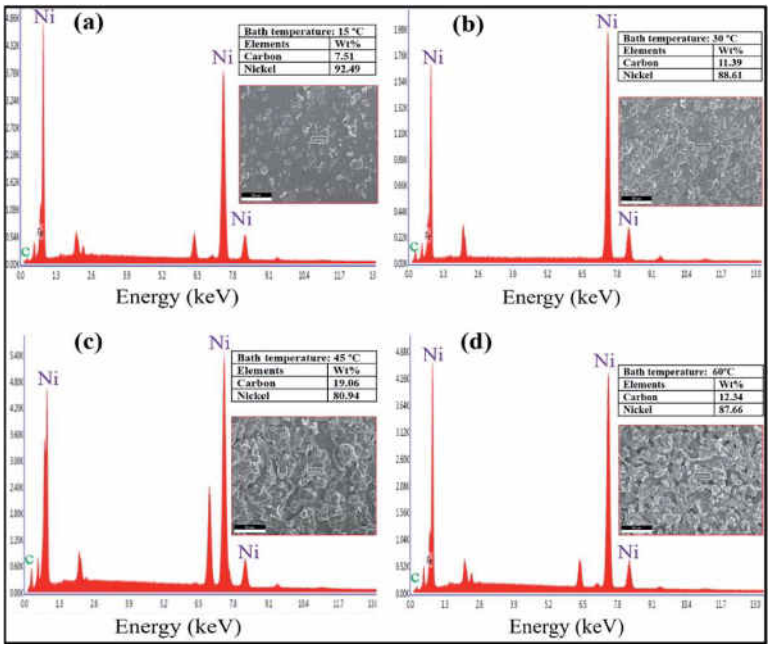
Grain sizes and micro hardness of deposited coatings

Down fig shows the XRD patterns of graphene based composite coatings deposited at temperatures (15 _C, 30 _C, 45 _C and 60 _C, respectively). It clearly can be observed that the peak widths of deposited coatings at

peak temperature 45 C are more boarder than the peaks widths at lower or higher temperature. In general, the introduction of graphene nanosheets increases the preferred orientation at (200) with increasing the deposition temperature due to the increasing of graphene/carbon content in coating, which increases the peak intensity of (200). Nevertheless, the peak intensity of coating deposited at temperature of 60 C was increased due to the rapid reduction of nickel ions at high temperature deposition
and increasing the nucleation orientations on both (111) and (200) planes. Although, the nucleation preferably to take place around the graphene sheets and it is estimated that not all grains in the composite are affected by graphene sheets during high temperature deposition. This can be one reason of higher peak intensity of (200) than (111). These results suggest that the introduction of grapheme nanosheets in Ni deposition greatly alter the pattern of preferred orientations, crystal orientation and growth behavior as also reported in other data. This was attributed to decrease in the grain size of nickel matrix due to incorporating the graphene into nickel matrix and blocking the Ni crystal growth. The average grain sizes of the composite coatings prepared at different temperature were calculated by the Scherrer's equation35 and Scherrer's equation n parameters are given in Table S1 of ESI.

D ¼ Kl/b cos q (1)

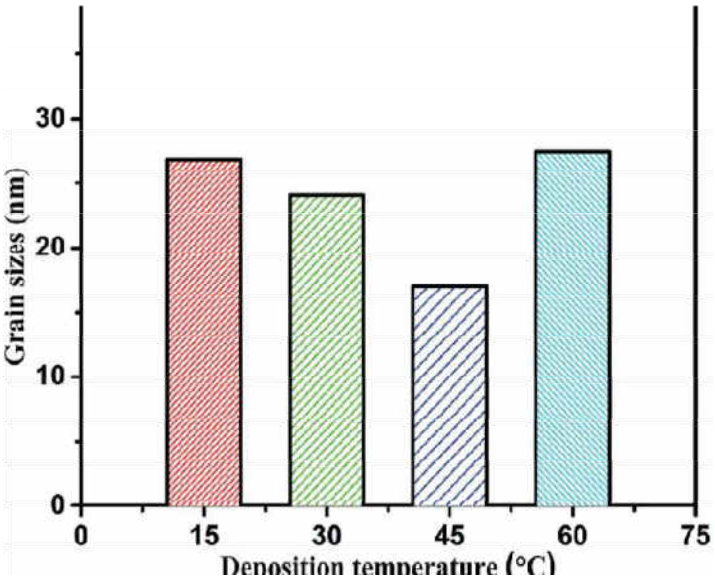
where D is the average crystalline size, K is the Scherrer constant, l is the wave length, b is the full width half maxima (FWHM) and q is the diffraction angle.



XRD patterns of Ni–graphene composite coatings deposited at temperatures (a) 15 _C, (b) 30 _C, (c) 45 _C and (d) 60 _C

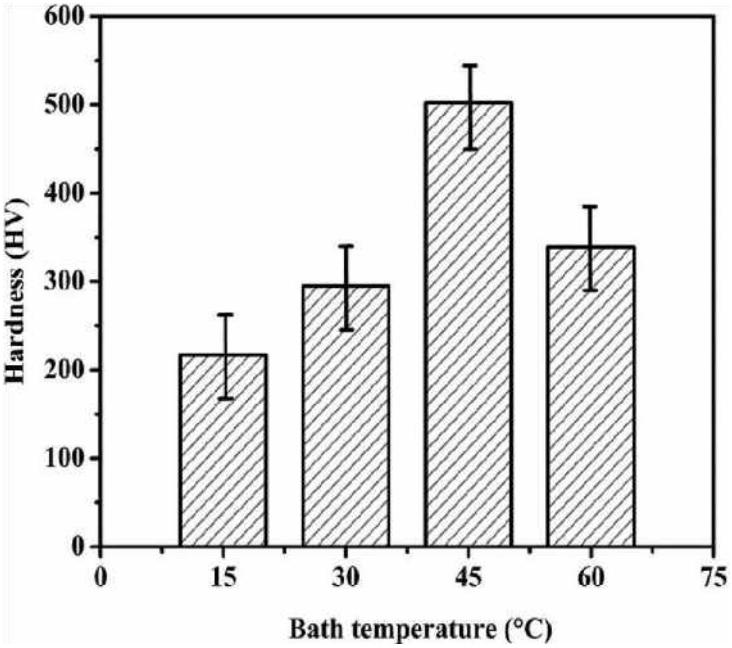
The grain sizes of the deposited coatings at different bath temperatures are shown in the down fig. The presence of graphene into the nickel matrix ensured the grains resonant, because the graphene incorporated in nickel matrix hinder the grain growth for reduced nickel ions and also increased the nucleation sites. The grain sizes of the composite coatings were decreased as the deposition temperature increased up to the peak value temperature 45 _C then increased with further increasing the bath temperature. There are two possible reasons;

firstly, at the lower temperature the nucleation process is slow that provided less nickel nucleation sites for graphene to incorporate into Ni matrix. Secondly, at the higher temperature the nickel reduction reaction is very fast, so less aggregate of graphene nanosheets engulfed into nickel matrix and also agglomeration of graphene occurred at higher temperature as discussed earlier. The above results show that the grain sizes was decreased due to the maximum incorporation of carbon contents in the coatings under optimum deposition temperature. It is suggested to study the optimum temperature which allows the large carbon contents addition in the composite coatings.



Effect of deposition temperature on the grain sizes of composite coatings.

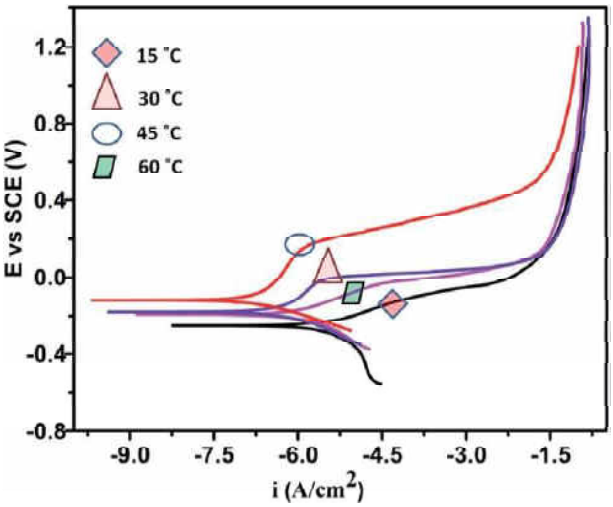
Demonstrates the effect of bath temperature on the Vickers Micro hardness of composite coatings. The hardness of nickel graphene composite coatings increased linearly up to the peak value of temperature 45 _C. The micro hardness of the composite coatings changes in the similar drift as the carbon content does with the electrodeposition temperature. The presence of graphene nanosheets in the metal matrix resist the motion of dislocations and obstruct the plastic row.27 In addition, the smaller size of graphene sheets that is particulate phase and intrinsic excellent mechanical properties of graphene are the others reasons of higher micro hardness.35 This increased in hardness is due the strengthening effects of smaller size graphene nanosheets existed in composite



Micro hardness of composite coatings prepared at different temperatures

Effect of deposition temperature on corrosion resistance properties of deposited coatings

The polarization curves of the Ni–graphene composite coatings deposited at different bath temperatures were performed and are shown in the down fig



Effect of deposition temperature on the polarization curves of composite coatings in 3.5% NaCl solution.

Effect of deposition temperature on the corrosion potentials and corrosion current densities of composite coatings

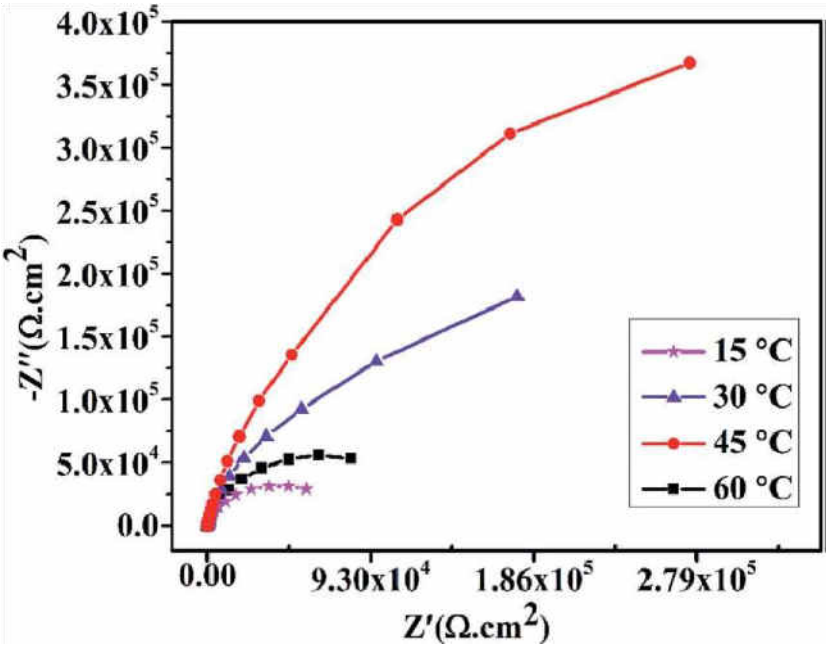
Deposition of temprature	Icorr(A cm_2)	Ecorr((V))
15	3.870	-0.253
30	1.474	-0.193
45	2.766	-0.119
60	1.622	-0.198

Table contains the data of corrosion current densities (Icorr) and corrosion potentials (Ev) determined from the polarization curves. It is clear from results that the composite coatings obtained at 45 C have lower corrosion current densities and higher corrosion potentials than

coatings obtained at lower and higher temperature, indicative of improved corrosion resistance of coatings deposited at 45 C. The composite coatings show the increasing corrosion resistance case the temperature increased from 15 C to 45 C (as shown in Table .

With further increasing the deposition temperature, the corrosion resistance decreased significantly. There are several factors responsible for improved and decreased corrosion resistance at different deposition temperatures. Firstly, the uniformly distributed graphene sheets called the micron holes, crevices and gaps in the nickel matrix, homogeneous dispersion of graphene during the deposition process and inert physical barrier property of graphene are responsible for improved corrosion resistance. Secondly, when the deposition temperature rises to 60 C, one cracks appeared on the surface of coatings and some hydrogen atoms absorbed on the coatings surface and diffused inside the deposited coatings and in result residual stress appeared,42,43 so decreased in corrosion resistance of composite coatings prepared at higher temperature 60 C.

The electrochemical impedance spectroscopy (EIS) test was performed in 3.5% NaCl solution to study the anti-corrosion properties of composite coatings obtained at different bath temperatures. down fig shows the Nyquist plots of composite coatings prepared at temperatures (15 C, 30 C, 45 C and60 C, respectively)



Effect of deposition temperature on the impedance spectra of composite coatings in 3.5% NaCl solution.

In addition, the comparison of pure Ni coating and pure graphene coating deposited with similar method at 45 C are shown in Fig. S1 of ESI. It was found that the pure Ni and pure graphene coatings exhibit poor corrosion resistance property than Ni–graphene composite coating. To test the long time performance of composite coating, EIS was performed to study the anticorrosion property of composite coating prepared via similar method at 45 C and impedance results are given in Fig. S2 of ESI. It can be clearly observed that the coatings deposited at peak temperature 45 C have higher impedance than coatings deposited at lower or higher temperatures. Meanwhile, the obtained EIS spectra of coatings deposited at lower or higher temperature shows narrow semi circles. In fact, the

diameter of the semicircles decides the anticorrosion property of coatings and the larger diameter ensures the better corrosion resistance.35 Therefore, it is obvious that the composite coating
deposited at 45 C acquires high impedance and possess the superior anti corrosion property.

Conclusions

In this paper, Ni–graphene composite coatings were successfully electrodeposited at temperatures (15 C, 30 C, 45 C and 60 C, respectively). The surface morphologies, thickness and composition of composite coatings are greatly affected by electrodeposition temperature. The surface coarseness and carbon content in the composite coating increases with the deposition temperature until a peak value at temperature 45 C, then the carbon content decreases with the further increasing of deposition temperature and surface roughness remain almost the same. The thickness of the Ni–graphene composite coatings were increased with the increasing of electrodeposition temperature.

Result

The results of XRD pattern reveal that the incorporation of graphene sheets in the nickel matrix increased the preferred orientation on (200) with the function of grain sizes. The grain sizes, micro hardness and corrosion resistance of the composite coatings change with the deposition temperature in the same way as carbon content performs, and these factors obtained the peak values at the optimum temperature 45 _C. These results demonstrate that the presence of graphene sheets in the composite coatings increase the surface roughness, improve the micro hardness, refine the grain sizes and enhance the corrosion resistance properties of composite coatings.

A

PROJECT REPORT ON

"STUDY OF WIND ENERGY & SUSTAINABLE DEVELOPMENT"

Submitted by

AMAR BASAVARAJ BIRADAR

In partial fulfillment for the award of the degree
Of

MASTER OF SCIENCE
IN
PHYSICS

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DEPARTMENT OF PHYSICS
SAVITRIBAI PHULE PUNE UNIVERSITY
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Examination Seat No. 201265

UNIVERSITY OF PUNE, PUNE 411 007

BONAFIDECERTIFICATE

This is to certify that this project report entitled **"STUDY OF WIND ENERGY & SUSTAINABLE DEVELOPMENT"** is the bonafide work of "**AMAR BASAVARAJ BIRADAR**" of M.Sc. Physics during the academic year 2020-2021who carried out the project work under my supervision.

Date:

Mr.PRASHANT GHULE
ProjectGuide

Dr.RAMAKANT P JOSHI
Head, Department of Physics

INTERNAL EXAMINER

EXTERNAL EXAMINER

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I would also like to thank **Dr.RAMAKANT P JOSHI**, Head, Department of Physics, the teaching faculty and all non-teaching staff of my college for their support in completing the work successfully. I am grateful to my Guide **Mr.PRASHANT GHULE**, for his encouragement, guidance and supervision of my project work during this year.

My Friends have been of great help to me during the project work. My ideas were shaped and refined progressively through my discussions with them from time to time. I cannot miss to thank them all. There were some persons who were not directly but indirectly involved in my preparatory/experimental work. I heartily appreciate their contribution and thank them too.

Date:

Signature of student

AMAR BASAVARAJ BIRADAR

M.Sc, Physics

Year 2020-2021

LIST OF CONTENTS

ABSTRACT

Wind power capacity has experienced tremendous growth in the Past decade, thanks to wind power's environmental benefits, technological advance, and government incentives. This paper presents the recent developments in wind energy conversion systems, and their social and environmental benefits. Integration of large scale wind farms into power systems presents some challenges that must be addressed, such assystem operation and control, system stability, and power quality. This paper describes modern wind power systems, presents requirements of wind turbine connection and discusses the possible control methods for wind turbines to meet the specifications.

CHAPTER-1

INTRODUCTION

Wind turbine technology has undergone a revolution during the last century. The attention has continued to grow as the demands on reducing polluting emissions have increased .The global wind energy sector is still developing rapidly. For example, EU countries plan to develop large scale offshore wind farms, 10000 MW by 2010, including an expected offshore wind power capacity of 4000 MW in the UK. The target for installed wind energy is 5500 MW in Denmark by 2030, out of which 4000 MW will be offshore. With the development of wind turbine technology, large scale wind farms of hundreds MW level are being developed in many countries. These modern wind farms are usually connected to the power grid. The wind power penetration levels in the networks could be high, for example, average wind power penetration levels of 20-30 % with peak penetration level up to 100%. Which will effectively reduce the requirement on the fossil fuel based conventional power generation; however, it also presents many challenges to modern power systems. The issues, such as power system operation and control, system stability and power quality, need to be addressed in order to realise good security and power quality for the power systems integrating large scale wind power. Technical constraints of power generation integration in a power system may in general be associated with the thermal limit, frequency and voltage control and stability. Grid codes are set up to specify the relevant requirements, these specifications have to be met in order to integrate wind turbinesinto the grid.This paper will discusses the important issues related to the large scale wind power integration into modern power systems. Firstly, the wind power generation and transmissionwill be described; the impacts of wind farm on power quality issues are to be analysed, then the technical requirements for wind farm grid connection will be introduced. The possible operation and control methods to meet the specifications and to improve system stability are discussed.

CHAPTER-2

DIFFERENT TYPES OF WIND FARMS

2.1 Wind farms:

A "wind farm" is a group of wind turbines in the same location used for production of electric power. Individual turbines are interconnected with a medium voltage (usually 34.5 kV) power collection system and communications network. At a substation, this medium-voltage electrical current is increased in voltage with a transformer for connection to the high voltage transmission system It covers an extended area of hundreds of square miles (square kilometers), but the land between the turbines may be used for agricultural or other purposes. A wind farm may be located off-shore to take advantage of strong winds blowing over the surface of an ocean or lake.

2.2 Types of wind farms:

A large wind farm may consist of several hundred individual wind turbines which are connected to the electric power transmission network and can be located either in-land (onshore) or in bodies of water (offshore).

1. ON-SHORE wind farms.
2. OFF-SHORE wind farms.
3. NEAR SHORE wind farms.
4. AIR-BORNE wind farms.

2.2.1 ON-SHORE wind farm:

Wind farms: Converts wind kinetic energy-mechanical energy-electrical energyWind turbines operate on a simple principle i.e., the energy in the wind turns three propellerlike blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity. Wind turbines are mounted on a tower to capture the most energy. At 30 meters or more above ground, they can take advantage of faster and less turbulent wind.Early turbines were small by today's standards, with capacities of 20-30 kW each. Since then, they have increased greatly in size delivering up to 7 MW.

A regular onshore turbine last for around 20 yearsnormally it takes about 2-3 months before the wind turbine has paid itself back. This also includes the energy, which were used to produce, install, maintain and remove the wind turbine.Cheaper foundation, cheaper integration with electrical-grid network.

Fig 2.2.1 On shore wind farm

Wind turbines are noisy each one can generate the same level of noise as a family car travelling 70 mph. Some people think that the large towers of wind turbines destroy the view of the landscape.

2.2.2 OFF-SHORE wind farm:

Wind farms: Off shore wind farms is also called as floating wind parks .Floating wind parks are wind farms that site several floating wind turbines closely together to take advantage of common infrastructure such as power transmission facilities. A floating wind turbine is an offshore wind turbine mounted on a floating structure that allows the turbine to generate electricity.

An offshore wind turbine is stronger than an onshore turbine. It lasts around 25-30 years, and produces about 50 % more energy than an onshore turbine. When a strong wind blows, it produces around 3-5 MW per hour. Higher and more constant wind speed.

Fig2.2.2 Off-shore wind farm

Offshore wind power can help to reduce energy imports, reduce air pollution and greenhouse gases (by displacing fossil-fuel power generation), meet renewable electricity standards, and create jobs and local business opportunities. However, according to the US Energy Information Agency, offshore wind power is the most expensive energy generating technology being considered for large scale deployment". The advantage is that the wind is

Much stronger off the coasts, and unlike wind over the continent, offshore breezes can be Strong in the afternoon, matching the time when people are using the most electricity. Offshore turbines can also be "located close to the power-hungry populations along the coasts, eliminating the need for new overland transmission lines".

Offshore wind more economically viable:

- Improving wind performance models, including how design conditions and the wind resource are influenced by the presence of other wind farms.
- Reducing the weight of turbine materials.
- Eliminating problematic gearboxes.
- Turbine load-mitigation controls and strategies.
- Turbine and rotor designs to minimize hurricane and typhoon damage.
- Economic modeling and optimization of costs of the overall wind farm system, including installation, operations, and maintenance.
- Service methodologies, remote monitoring, and diagnostics.

2.2.3 NEAR SHORE wind farm:

Wind farms: Converts wind kinetic energy-mechanical energy-electrical energy Wind turbines operate on a simple principle i.e., the energy in the wind turns three propellerlike blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity. Wind turbines are mounted on a tower to capture the most energy. At 30 meters or more above ground, they can take advantage of faster and less turbulent wind.

Fig 2.2.3 Near shore wind farm

A regular onshore turbine last for around 20 years normally it takes about 2-3 months before the wind turbine has paid itself back. This also includes the energy, which were used to produce, install, maintain and remove the wind turbine. Cheaper foundation, cheaper integration with electrical-grid network.

2.2.4 AIR-BRONE wind farm:

Wind farms: Airborne wind turbines are suspended in the air without a tower, thus saving any expenses on tower construction. This type of turbines can operate in low or high altitudes, and the variants include,

- AWT supported by balloon buoyancy
- AWT working on kites
- AWT based on tethered auto gyros

Functioning of an airborne wind turbine is a combination of kite and balloon, and the kytoon (a compressed name for kite and balloon) is kept aloft by steady breezes Airborne wind turbines are secured to the ground using electrically conductive tethers, which transmit energy to the Ground.

Fig 2.2.4 Air-borne wind farm

The airborne wind turbine technology can be categorized under four major types based on their design concept:

- Kite type
- Balloon type
- Kytoon type (Combined Kite & Balloon)
- Tethered auto gyro type

A research on airborne wind turbine technology innovations reveals that the “Kite type AWTs” technique, the most common type, has high scope of growth in the future; it has contributed for about 44% of the total airborne wind energy during 2008 – 2012. The kite type AWTs extract energy through wind turbines suspended at high altitudes using kites such as multi-tethered kite, kite and dual purpose circular fan, rotary wing kites etc. The next popular technology is the “Tethered gyro type AWT”, which has shown a growth rate of 29% in the last five years. In the tethered autogyro type, wind turbines are floated by means of tethered crankshaft, unmanned aerial vehicle, gyroplane, or gyrocopter arrangements along with an unpowered Rotor in autorotation to develop lift and engine powered propeller to provide thrust.

Fig 2.2.4 Kytoon type (Combined Kite & Balloon)

CHAPTER-3

IMPACTS OF WIND FARMS ON POWER QUALITY:

On the local level, voltage variations are the main problem associated with wind power. This can be the limiting factor on the amount of wind power which can be installed. In normal operational condition, the voltage quality of a wind turbine or a group of wind turbines may be assessed in terms of the following parameters

- Steady state voltage under continuous production of power
- Voltage fluctuation
- Flicker during operation
- Flicker due to switching
- Voltage variation

The influence of connecting a wind farm on the gird voltage is directly related to the short circuit power level. Theshort circuit power level in a given point in the electrical network represents the system strength.

The voltage variation issue results from the wind velocity and generator torque. The voltage variation is directly related to real and reactive power variations. The voltage variation is commonly classified as under:

• Voltage Sag/Voltage Dips.

• Voltage Swells.

• Short Interruptions.

• Long duration voltage variation.

The voltage flicker issue describes dynamic variations in the network caused by wind turbine or by varying loads. Thus the power fluctuation from wind turbine occurs during continuous operation. The amplitude of voltage fluctuation depends on grid strength, network impedance, and phase-angle and power factor of the wind turbines. It is defined as a fluctuation of voltage in a frequency 10–35 Hz. The IEC 61400-4-15 specifies a flicker meter that can be used to measure flicker directly.

The harmonic results due to the operation of power electronic converters. The harmonic voltage and current should be limited to the acceptable level at the point of wind turbine connection to the network.

The way of connecting the wind generating system into the power system highly influences the power quality. Thus the operation and its influence on power system depend on the structure of the adjoining power network.

The voltage variation, flicker, harmonics causes the malfunction of equipment's namely microprocessor based control system, programmable logic controller; adjustable speed drives, flickering of light and screen. It may leads to tripping of contractors, tripping of protection devices, stoppage of sensitive equipment's like personal computer, programmable logic control system and may stop the process and even can damage of sensitive equipment's. Thus it degrades the power quality in the grid.

CHAPTER-4

TYPES OF WIND TURBINES

4.1 WIND TURBINE:

Converts wind kinetic energy into electrical power numerous industrial turbine designs, for example horizontal and vertical axis wind turbines clean energy alternative, with little to no environmental impact Affects environmental aesthetic integrity, some migratory bird patterns, and downwind wind velocity.

4.2 TYPES OF WIND TURBINES:

There are two types of wind turbines

- HAWT (horizontal axis wind turbine)
- VAWT (vertical axis wind turbine)

4.2.1 HAWT (horizontal axis wind turbine):-

Most common industrial design today HAWT have the main rotor shaft and generator at the top of a tower andmust be pointed into the wind .HAWT, where wind velocities are high Able to increase height of tower to harness higher wind velocities at higher altitudes.

Horizontal-axis wind turbines (HAWT) have the main rotor shaft and electrical generator at the top of a tower, and may be pointed

Into or out of the wind. Small turbines are pointed by a simple wind vane, while large turbines generally use a wind sensor coupled with a servo motor. Most have a gearbox, which turns the slow rotation of the blades into a quicker rotation that is more suitable to drive an electrical generator.Parts of the wind turbine

Blades:

The lifting style wind turbine blade: These are the most efficiently designed, especially for capturing energy of strong, fast winds. Some European companies actually manufacture a single blade turbine

The drag style wind turbine blade: most popularly used for water mills, as seen in the Old Dutch windmills. The blades are flattened plates which catch the wind. These are poorly designed for capturing the energy of heightened winds.

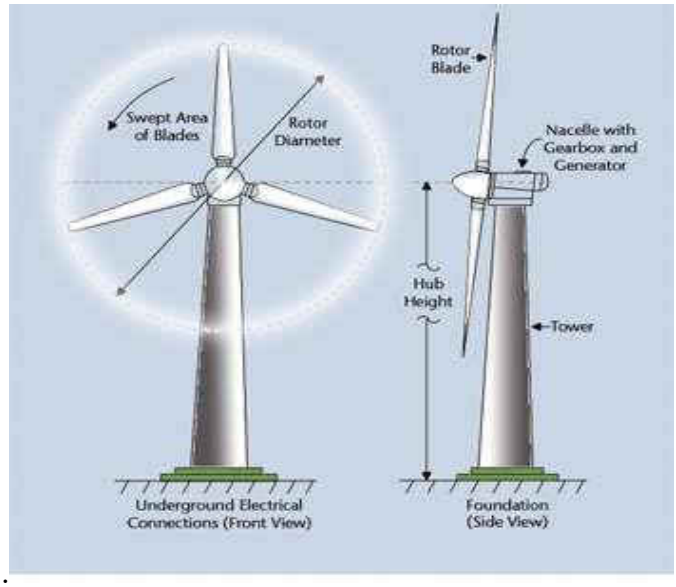

Fig 4.2.1 Horizontal-axis wind turbines (HAWT)

4.2.2 Vertical-axis wind turbines (VAWTs):

VAWTs are a type of wind turbinewhere the main rotor shaft is set traverse, not necessarily vertical, to the wind and the main components are located at the base of the turbine. This arrangement allows the generator and gearbox to be located close to the ground, facilitating service and repair. VAWTs do not need to be pointed into the windwhich removes the need for wind-sensing and orientation mechanisms.

Major drawbacks for the early designs (Savonius, Darrieus and giromill) included the significant torque variation during each revolution, and the huge bending moments on the blades. Later designs solved the torque issue by providing helical twist in the blades.

A VAWT tipped sideways, with the axis perpendicular to the wind streamlines, functions similarly. A more general term that includes this option is "transverse axis wind turbine". For example, the original Darrieus patent, US Patent 1835018, includes both options.

Drag-type VAWTs such as the Savonius rotor typically operate at lower tipspeed rotor than lift-based VAWTs such as Darrious rotors.

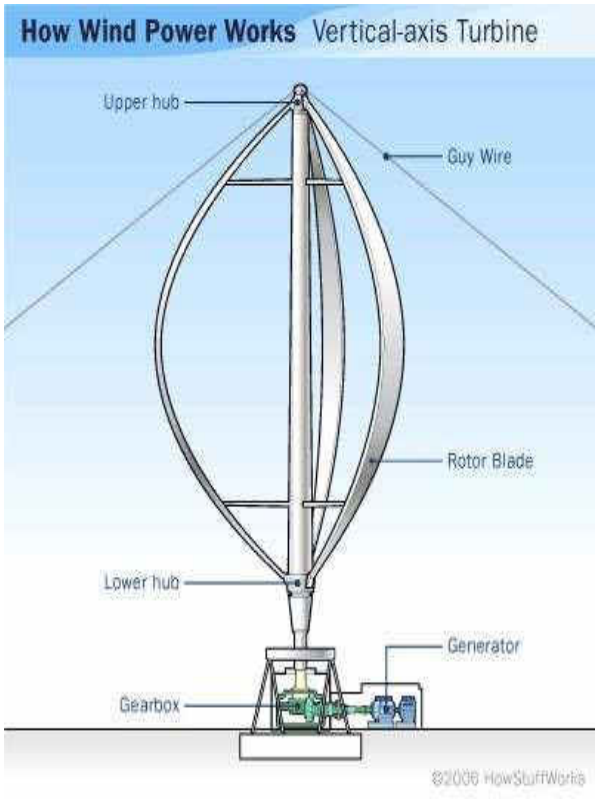

Fig 4.2.2 Vertical-axis wind turbines (VAWTs)

CHAPTER-5

OVER-VIEW OF WIND TURBINE

5.1 Wind turbine:

Wind turbines harness the power of the wind and use it to generate electricity. Simply stated, a wind turbine works the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity. This illustration provides a detailed view of the inside of a wind turbine, its components, and their functionality.

Wind turbines are designed to exploit the wind energy that exists at a location. Aerodynamic modeling is used to determine the optimum tower height, control systems, number of blades and blade shape.

Wind turbines convert wind energy to electricity for distribution. Conventional horizontal axis turbines can be divided into three components.

- The rotor component, which is approximately 20% of the wind turbine cost, includes the blades for converting wind energy to low speed rotational energy.
- The generator component, which is approximately 34% of the wind turbine cost, includes the electrical generator, the control electronics, and most likely a gearbox (e.g. planetary gearbox, adjustable-speed drive or continuously variable transmission) component for converting the low speed incoming rotation to high speed rotation suitable for generating electricity.

The structural support component, which is approximately 15% of the wind turbine, concludes the tower and rotor yaw mechanism.

A 1.5 MW wind turbine of a type frequently seen in the United States has a tower 80 meters high. The rotor assembly (blades and hub) weighs 48,000 pounds (22,000 kg). The nacelle, which contains the generator component, weighs 115,000 pounds (52,000 kg). The concrete base for the tower is constructed using 58,000 pounds (26,000 kg) of reinforcing steel and contains 250 cubic yards of concrete. The base is 50 feet (15 m) in diameter and 8 feet (2.4 m) thick near the center.

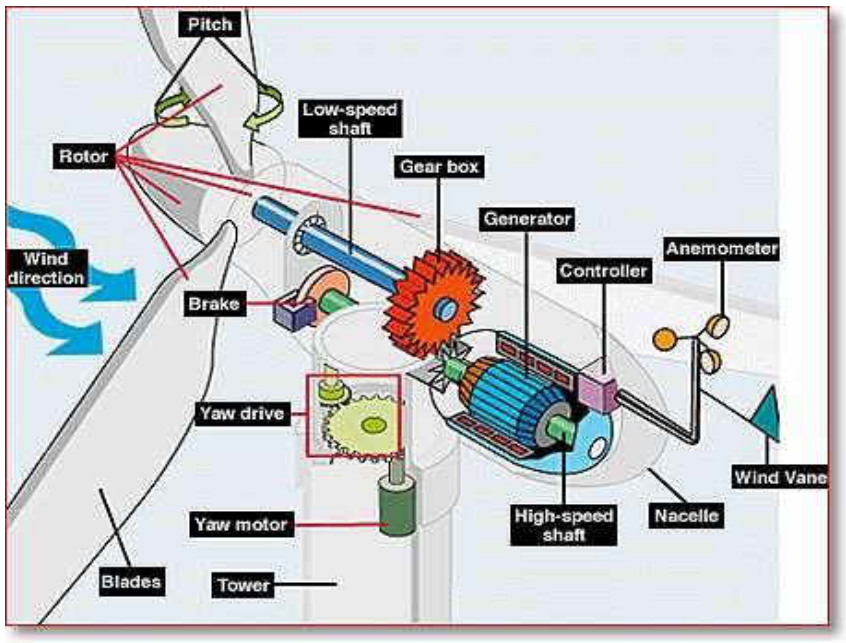

Fig 5.1 wind turbine

5.2 Operation of wind turbine:

Anemometer:

Measures the wind speed and transmits wind speed data to the controller.

Blades:

Lifts and rotates when wind is blown over them, causing the rotor to spin. Most turbines have either two or three blades.

Brake:

Stops the rotor mechanically, electrically, or hydraulically, in emergencies.

Controller:

Starts up the machine at wind speeds of about 8 to 16 miles per hour (mph) and shuts off the machine at about 55 mph. Turbines do not operate at wind speeds above about 55 mph because they may be damaged by the high winds.

Gear box:

Connects the low-speed shaft to the high-speed shaft and increases the rotational speeds from about 30-60 rotations per minute (rpm), to about 1,000-1,800 rpm; this is the rotational speed required by most generators to produce electricity. The gear box is a costly (and heavy) part of the wind turbine and engineers are exploring "direct-drive" generators that operate at lower rotational speeds and don't need gear boxes.

Generator:

Produces 60-cycle AC electricity; it is usually an off-the-shelf induction generator.

High-speed shaft:

Drives the Generator.

Low-speed shaft:

Turns the low-speed shaft at about 30-60 rpm.

Nacelle:

Sits atop the tower and contains the gear box, low- and high-speed shafts, generator, controller, and brake. Some nacelles are large enough for a helicopter to land on.

Pitch:

Turns (or pitches) blades out of the wind to control the rotor speed, and to keep the rotor from turning in winds that are too high or too low to produce electricity.

Rotor:

Blades and hub together form the rotor.

Tower:

Made from tubular steel (shown here), concrete, or steel lattice. Supports the structure of the turbine. Because wind speed increases with height, taller towers enable turbines to capture more energy and generate more electricity.

Wind direction:

Determines the design of the turbine. Upwind turbines—like the one shown here—face into the wind while downwind turbines face away.

Wind vane:

Measures wind direction and communicate with the yaw drive to orient the turbine properly with respect to the wind.

Yaw drive:

Orients upwind turbines to keep them facing the wind when the direction changes. Downwind turbines don't require a yaw drive because the wind manually blows the rotor away from it.

Yaw motor:

Powers the yaw drive.

CHAPTER-6

ADVANTAGES OF WIND FARMS

Advantages:

1. The wind is free and with modern technology it can be captured efficiently.
2. Once the wind turbine is built the energy it produces does not cause green house gases or other pollutants.
3. Although wind turbines can be very tall each takes up only a small plot of land. This means that the land below can still be used. This is especially the case in agricultural areas as farming can still continue.
4. Many people find wind farms an interesting feature of the landscape.
5. Remote areas that are not connected to the electricity power grid can use wind turbines to produce their own supply.
6. It is cheaper to put more coal into an existing power station than to build a new wind farm
7. Wind turbines are available in a range of sizes which means a vast range of people and businesses can use them. Single households to small towns and villages can make good use of range of wind turbines available today.

CHAPTER-7
CONCLUSION

Nowadays, wind energy is developing rapidly all around the world. There are many options of wind power generation and collection system configuration. The entire world is seeking more energy, including energy generated by wind power .The basic components of a wind turbine are illustrated and explained.Wind energy has matured to a level of development where it is ready to become a generally accepted utility generation Technology, a brief discussion of this development is presented.

CHAPTER-8

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