PPSU
P P SAVANI UNIVERSITY

Student Feedback Form - Feedback Analysis Report During the Academic Year 2022-23

S. No.	Question's	Excellent	Very Good	Good	Fair	Poor	Total Weightage	Percentage	3-Scale Weightage
1	The institute's current curriculum is pertinent to the workforce	691	632	894	175	53	9068	74.05%	2.22
2	Curriculum meets industry needs and aids in increasing an organization's efficacy and efficiency.	503	802	878	204	58	8823	72.05%	2.16
3	The current curriculum offers application-based courses that address the knowledge, skill, attitude, and innovation needs of industry.	590	711	869	214	61	8890	72.60%	2.18
4	The curriculum's extensive content satisfies the prerequisites for human resources orientation.	530	722	876	246	71	8729	71.29%	2.14
5	The current curriculum provides needs-based learning and satisfies industrial standards.	533	731	878	227	76	8753	71.48%	2.14
6	The curriculum fosters motivating the aids students in launching their businesses.	526	734	880	233	72	8744	71.41%	2.14
7	Curriculum fills the knowledge gap between academia and industry.	505	721	902	226	91	8658	70.71%	2.12
8	Stakeholder input is considered when designing curricula, and the Board of Studies responds to comments.	469	724	938	232	82	8601	70.24%	2.11
9	The curriculum assists me in gaining the requisite knowledge as well as the skills and competences.	503	747	894	231	70	8717	71.19%	2.14
10	The Curriculum is supplemented in courses that are of significance to interdisciplinary and cross cutting in character.	517	688	968	203	69	8716	71.18%	2.14
11	Current text books and reference books are useful to achieve rank in area of academics	522	584	789	253	297	8116	66.28%	1.99
						AVERAGE SCORE	**8,710.45**	**71.13%**	**2.13**

Authorized Signature

Authorized Person

Registrar
P P Savani University

P SAVANI UNIVERSITY

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Date: 2024.05.16 10:52:26+05'30'

ACTION TAKEN REPORT

Student		
S. No.	**Suggestions**	**Action Taken**
1	Current textbooks and reference books are useful to achieve rank in area of academics	❖ University library is offering following facilities to facilitate learning and improve access to the resources. ❖ **Data Bases:** DELNET Subscription ▪ E - Journals on DELNET- 379 ▪ E- Books on DELNET-7851 ▪ No. of books -805 ▪ J-Gate Science and Technology-E-Journals Database-No. of Journals-20649 ▪ Library Management Software-KOHA ▪ Addition of new textbooksand reference books-345 new books purchased (2022-23).

Registrar

Registrar
P P Savani University

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Date: 2024.05.16 10:52:26+05'30'

1.4.2 FEEDBACK PROCESS OF THE INSTITUTION MAY BE CLASSIFIED AS:

OPTIONS (OPT ANY ONE THAT IS APPLICABLE):

EVIDENCES FOR ACTION TAKEN REPORT ON STUDENT

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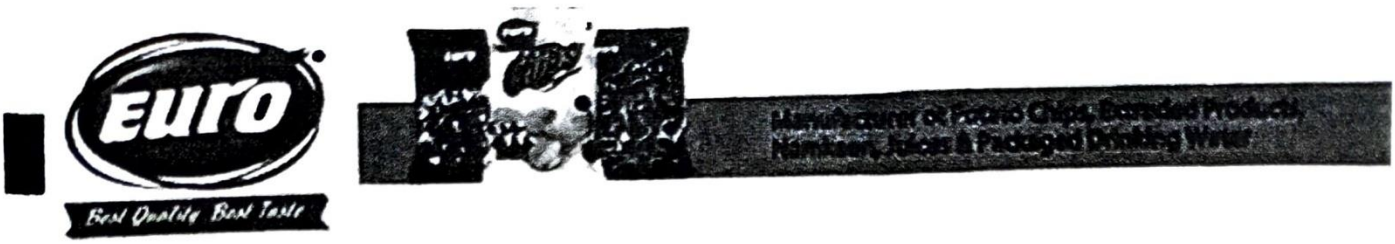
Date: 2024.05.16 10:52:26+05'30'



CERTIFICATE

TO WHOM SO EVER IT MAY CONCERN

This is to certify that Ms. Vrushali Desai. Student of B.Sc Microbiology. of P P Savani University. has completed her Training at EURO INDIA FRESH FOODS LTD., SURAT

Training Period: 01st February 2022 To 31st March 2023

During this period, we found her to be sincere and hardworking and we wish her success in all future endeavors.

EURO INDIA FRESH FOODS LIMITED • HR SURAT

AUTHORISED SIGNATORY

(DHAVAL PATEL – HR MANAGER)

PRINCIPAL
SCHOOL OF SCIENCES
P. P. SAVANI UNIVERSITY
SURAT - 394125

Digitally signed by Sateesh Biradar
Date: 2024.05.16 10:52:26+05'30'

Corporate Office : 601, 6th Floor, The Summit Business Bay, Andheri Kurla Road, Near Cinemax Theatre, Andheri (E), Mumbai - 400 059 Tel No.: 022-26841 800, 26841900
Factory : A-22/1, Ichchhapore G.I.D.C., Ghatpore, Hazira Magdalla Road, Surat - 394 510. Tel No.: (0261) 291 3021, 291 3041
www.eurondiafoods.com customercare@eurondiafoods.com Toll Free : 1000 233 00911

APEX HEALTHCARE LIMITED

TO WHOM IT MAY CONCERN

DATE:31/03/23

We would like to thank the student below for participating in the two month (feb-2023 to mar-2023) factory Internship at **Apex Healthcare Limited** on We hope that the experience was both informative and valuable for the student.

During the Internship, they had the opportunity to tour the factory, meet with employee, and observe the **Microbiology** Process. We hope that this provided them with a deeper understanding of the manufacturing process and the different roles and responsibilities within the factory.

We value the time and effort student have put into this Internship, and we hope that the knowledge and experience gained will benefit them in their future endeavors.

Once again, thank you for your participation and we look forward to having you with us again.

Student Names:

Mr. Dhrumil Panchal

APEX HEALTHCARE LIMITED ANKLESHWAR

PRINCIPAL
SCHOOL OF SCIENCES
P. P. SAVANI UNIVERSITY
SURAT - 394125

Digitally signed by Sateesh Biradar
Date: 2024.05.16 10:52:26+05'30'

Abaris Healthcare Pvt.Ltd.
406, Saffron, Panchwati, Ahmedabad - 380 006. Ph. 079 - 26440704, 26430915, E-mail : info@abarishealthcare.com
E-mail : abarishhealth@yahoo.co.in

6th April 2023

To whosoever it may concern

Sub: Certificate of completion of Internship

This has reference to the internship as a part of curriculum of B.Sc. (Microbiology) by Ms. **Mansuri Arshin** and her attendance at our Rajpur plant for internship from 1st February 2023 to 31st March 2023.

This is to certify that she has completed her internship with basic training of microbiology department at our IV fluid and Injectable plant situated at Village: Rajpur, Taluka: Kadi, District: Mehsana.

During her internship, she has imparted training of working microbiological department, documentation, plate (soyabean casein) exposure in clean room area, microbial colony count, preparation of samples for incubation, operation of autoclave and basic method of fumigation of clean room area.

We wish her all the best for her career.

The certificate is issued without any obligation on the part of issuer.

For Abaris Healthcare Private Limited

Dipak Parmar
Chief Executive Officer
d.parmar@abrishealthcare.com

Copy to:

Ms. Mansuri Arshin
Samiyana park, Bungalow No 3,
Opposite shilpi Square,
Umraj road, Bharuch.

ABARIS HEALTHCARE PVT LTD RAJPUR

PRINCIPAL
SCHOOL OF SCIEN
P. P. SAVANI UNIVE
SURAT - 394125

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06

LUPIN

30th April 2023

Digitally signed by Satesh Biradar
Date: 2024.05.16 10:52:26+05'30'

To Whom So Ever It May Concern

This is to certify that **Mr. Dixita P Vansia** student of **P P Savani University, Dhamdod** has been appointed as a Vocational Trainee in our organization in **Quality Control Department** from **1st January 2023 to 30th April 2023.**

During the training we found the student Hardworking and Punctual.

We wish the student all success in the future endeavors.

For Lupin Limited

Hemantkumar Rana
Manager – Human Resources

PRINCIPAL
SCHOOL OF SCIENCES
P. P. SAVANI UNIVERSITY
SURAT - 394125

06

LUPIN LIMITED
Plot No. 9, 123, 123/1, 124, 125, GIDC Estate,
Ankleshwar - 393 002, Gujarat.
Tel. : +91-2646-268242 | 243 | 357 | 548

LUPIN

30th April 2023

To Whom So Ever It May Concern

This is to certify that **Mr. Dixita P Vansia** student of **P P Savani University, Dhamdod** has been appointed as a Vocational Trainee in our organization in **Quality Control Department** from **1st January 2023 to 30th April 2023.**

During the training we found the student Hardworking and Punctual.

We wish the student all success in the future endeavors.

For Lupin Limited

Hemantkumar Rana
Manager – Human Resources

PRINCIPAL
SCHOOL OF SCIENCES
P. P. SAVANI UNIVERSITY
SURAT - 394125

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Date: 2024.05.16 10:52:26+05'30'

GOOD PEOPLE
for GOOD HEALTH

UNIQUE PHARMACEUTICAL LABORATORIES

A Division of J. B. CHEMICALS & PHARMACEUTICALS LIMITED

09/05/2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mr. **PATEL JAYKUMAR NARESHBHAI (21SS03MB010)** student of M.Sc Microbiology, P P Savani University, has undergone internship training in our Micro department from **01/01/2023 to 30/04/2023**. He is found to be obedient, sincere and impeccable during his training period with us.

We wish him success in all his future endeavors.

Thanking you,

Very **UNIQUELY** Yours,
For **UNIQUE PHARMACUETICAL LABORATORIES**
(A DIV. OF J B CHEMICALS & PHARMACEUTICALS LTD)

BHARATSINH PARMAR
G.M (HUMAN RESOURCES)

PRINCIPAL
SCHOOL OF SCIENCES
P. P. SAVANI UNIVERSITY
SURAT - 394125

Digitally signed by Sateesh Biradar
Date: 2024.05.16 10:52:26+05'30'

Factory:
CIN: L24390MH1976PLC019380
Plot 218 to 219, GIDC Industrial Estate
Panoli - 394 116, Bharuch, Gujarat
+91 2646 272 472 / 784 / 304 / 783 / 335

Registered Office:
CIN: L24390MH1976PLC019380
Neelam Centre, 'B' Wing, 4th Floor,
Hind Cycle Road, Worli, Mumbai - 400030.
+91 22 24822222

Corporate Office:
CIN: L24390MH1976PLC019380
Cnergy IT Park, Unit A, 8th Floor,
Appa Saheb Marathe Marg,
Prabhadevi, Mumbai - 400025.
+91 22 24305200/8500

www.jbpharma.com

PPSU
P P SAVANI UNIVERSITY

Faculty Member Feedback Form - Feedback Analysis Report During the Academic Year 2022-23

S. No.	Question's	Excellent	Very Good	Good	Fair	Poor	Total Weightage	Percentage	3-Scale Weightage
1	The current syllabus's material meets industry needs, is adequate to close the knowledge gap between academics and industry standards and contemporary global scenarios, and improves students' understanding of key management functional areas.	140	94	35	2	1	1186	87.21%	2.62
2	The institute has enough space and educational materials to support efficient instruction.	110	112	41	7	2	1137	83.60%	2.51
3	The specified contact hours listed in the curriculum are adequate for the faculty to finish covering the material for each course.	128	109	30	4	1	1175	86.40%	2.59
4	The course or curriculum is as follows: Education that is Competency/Outcome Based.	121	116	25	10	0	1164	85.59%	2.57
5	The curriculum makes extensive use of E-content that I and LMS have generated, as well as ICT-based teaching.	101	119	41	9	2	1124	82.65%	2.48
6	With the development of ICT and reforms, the evaluation process is strong and efficient.	95	129	39	9	0	1126	82.79%	2.48
7	In terms of learning values, skills, knowledge, attitude, analytical capacities, applicability, relevance, and practical orientation to real-life circumstances, the current curriculum satisfies expectations.	125	108	34	3	2	1167	85.81%	2.57
8	The course's depth is essential to achieving both program-wide and program-specific outcomes.	129	106	33	3	1	1175	86.40%	2.59
					AVERAGE SCORE		1,156.75	85.06%	2.55

Authorized Signature

Authorized Person

Registrar
P P Savani University

P P SAVANI UNIVERSITY

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Date: 2024.05.16 10:52:26+05'30'

PPSU
P P SAVANI UNIVERSITY

ACTION TAKEN REPORT

Teachers		
S. No.	**Suggestions**	**Action Taken**
1	More field activities should be included for practical and knowledge building.	❖ The matter was taken in BOS meeting and field visits were planned accordingly
2	Curriculum is enhanced by including courses that are important for interdisciplinary studies	❖ The subject matter was brought up in the BOS meeting and subsequent steps were implemented following the meeting's outcome. ❖ Several Elective and Value-added courses have been chosen as interdisciplinary options.
3	Emphasize the necessity of incorporating additional skill lab hours for specialization.	❖ The matter was deliberated upon in the BOS meeting and actions were carried out in accordance with the meeting's conclusions. ❖ Allocate some skill lab hours in place of library hours
4	Innovative healthcare topics must be incorporated into the curriculum.	❖ The matter was discussed the BOS meeting and measures were undertaken as per meeting conclusion. ❖ Several supplementary courses as VAC courses as well encourage the students to attend conferences and certified courses on various digital platform to acquire insights into advancements in healthcare.
5	Curriculum fills the knowledge gap between academia and industry.	❖ Number of Clinical Posting hours will be increased from 4 to 6 hours/ week with effect April 2023 for Final year students. ❖ Students will be posted in Different Hospitals to get more Clinical exposure on patients.

P P SAVANI UNIVERSITY

Registrar

Registrar
P P Savani University

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Date: 2024.05.16 10:52:26+05'30'

1.4.2 FEEDBACK PROCESS OF THE INSTITUTION MAY BE CLASSIFIED AS:

OPTIONS (OPT ANY ONE THAT IS APPLICABLE):

EVIDENCES FOR ACTION TAKEN REPORT ON TEACHER

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Date: 2024.05.16 10:52:26+05'30'

P.P. Savani University

Department of Public Health

Date: 25-03-2023

5-Day Biostatistics Workshop and In-hand Training

Department of Public Health and School of Nursing, P.P. Savani University organised the 5-Day Biostatistics Workshop and In-hand training for the students of Masters in Public Health and BSc. Nursing on 23-03-2023 in School of Nursing room no 302. The speaker of the workshop was Dr. Gunjan Shah, Assistant Professor (Class-2) at Government Arts & Commerce College, Kachhal, Dist- Surat.

Total 78 students participated in the event 60 students from BSc. Nursing students, and 18 students from MPH. The students got the in-hand training of Statistical software SPSS for students.

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Date: 2024.05.16 10:52:26+05'30'

Principal
Department of Public Health
P P Savani University Surat

PPSU

P P SAVANI UNIVERSITY

NH 8, GETCO, NEAR BILTECH, VILLAGE; DHAMDOD, KOSAMBA

CERTIFICATE FOR VALUE ADDED COURSES

This is to certify that Mr. / Ms. DHODI POOJABEN ANIL BHAI. bearing Enrollment Number 19SNDNR007 of B.Sc Nursing SEM-VIII has completed the course entitled "DIGITAL NURSING SERVICES AND SOLUTIONS" organized by Nursing department from 22/05/2023 to 28/05/2023 and secured 12 marks in the assessment.

P.P. SAVANI SCHOOL

P.P. SAVANI SCHOOL OF NURSING
KOSAMBA, TA. MANGROL, SURAT-394 110

Course Coordinator | Principal | Registrar

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Sateesh Biradar
Date: 2024.05.16
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P P SAVANI SCHOOL OF NURSING
ACADEMIC YEAR 2022-23
P.B.B.Sc. 1st Year, SEMESTER –I

Date: 15/03/2023 TO 15/04/2023 Week:4-7

P B BSc. (N)	CLASS TIME TABLE		SEMESTER I		CLASS ROOM NO.	
DAY/TIME	MONDAY	TUESADAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
8:00 am - 8:55 am	Nutrition & Dietetics Ms.Shweta	FON Ms.Dhruvika	English Ms. Jwalin	English Ms. Jwalin	MSN Ms.Mahima.	MSN Ms.Mahima.
8:55 am - 9:50 am	English Ms. Queen	Nutrition & Dietetics Ms.Shweta	English Ms. Mohini	MSN Ms.Mahima.	Microbiology Ms.Jinal	Biochemistry Ms.Shayni
9:50 am - 10:00 am	**Mini break**					
10:00 am - 10:50 am	FON Ms.Dhruvika.	English Ms. Mohini	Nutrition & Dietetics Ms.Shweta	Biophysics Ms.Shayni	MSN Ms.Mahima.	Skill Lab Ms.Mahima.
10:50 am - 11:40 am	Skill lab Ms.Mahima	MSN Ms.Mahima	MSN Ms.Mahima	Skill Lab Ms.Mahima	Microbiology Ms.Jinal	Microbiology Ms.Jinal
11:40 am -11:45 am	**Mini break**					
11:45 am - 12:35 pm	FON Ms.Dhruvika.	Microbiology Ms.Jinal	Bioche mistry Ms.Shayni	Microbiology Ms.Jinal	English Ms. Jwalin	English Ms. Jwalin
12:35 pm - 1:30 pm	**Lunch break**					
1:30 pm-2:25 pm	Microbiology Ms.Jinal	English Ms. Mohini	Skill Lab Ms.Mahima	Biochemistry Ms.Shayni	English Ms. Queen	Microbiology Ms.Jinal
2:25 pm- 3:20 pm	Biochemistry Ms.Shayni	Microbiology Ms.Jinal	Microbiology Ms.Jinal	Microbiology Ms.Jinal	Biophysics Ms.Shayni	Biophysics Ms.Shayni

Sr. No.	Name of the faculty	Allotted hours/weeks
1	Ms.Mahima	10
2	Ms.Jinal	10
3	Ms.Shayni	07
4	Ms. Jwalin P	04
5	Ms.Shweta	03
6	Ms. Mohini	03
7	Ms.Dhruvika	03

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Class coordinator

Program coordinator

Principal

PRINCIPAL
P.P. SAVANI SCHOOL OF NURSING

SHREY INSTITUTE OF NURSING AND ALLIED SCIENCES, AHMEDABAD

(A Division of Shrey Hospitals Pvt. Ltd.)

1st STATE LEVEL CONFERENCE-2023

CERTIFICATE OF PARTICIPATION

This is to certify that

DR./PROF./MR./MS./MRS. Zeeba Rathod

has participated as Resource Person/Chairperson/Organizer/Delegate in **1st State Level Conference on "Redefining Women's Health through Innovations in Midwifery Practice"** organized by Shrey Institute of Nursing & Allied Sciences, on 4th May, 2023 at Senate Hall,Gujarat University, Ahmedabad.

Gujarat Nursing Council has accorded **5 Credit Hours** for this Conference for Resource Person/Chairperson/Organizer/Delegate vide letter GNC Ref. No. CNE/7915 dated 20th April 2023.

SPONSORS

Mr. Bharat Mahant
Organizing Chairman

Ms. Rinu Mathew
Conference Convenor

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Date: 2024.05.16 10:52:26+05'30'

GOVERNMENT COLLEGE OF NURSING NEW CIVIL HOSPITAL, MAJURA GATE SURAT, 395001

Certificate

This is to certify that Dr./Mr./Ms./Mrs.

Unnati Pravinbhai Chisla

has participated as a delegate in A National level conference on "explore latest challenges, innovation and advancement in nursing education" held at Government College of Nursing, Surat in collaboration with The Trained Nurses Association of India, Surat Gujarat on 29th April 2023 Gujarat Nursing Council has granted 5 credit hours wide letter No. CNE/4259 Dated 13/04/2023.

Dr. Indrawati Rao
Organizing chair person
GCON, Surat

Prof. Smital Chaudhari
Organizing Secretary
GCON, Surat

Mr. I. A. Kadiwala
Advisor SNA, TNAI
Gujarat Branch

Mr. Kiran Domadia
Secretary, TNAI
Gujarat Branch

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Anand Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 5 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Student list: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT029	PATEL AAYUSH DILIP	9 TO 4
2	19SP02PT048	GOHIL KRISHNAKUMARI JITENDRASINH	
3	19SP02PT063	RANA GUNATITSINHJI JAYDEEPSINHJI	
4	19SP02PT026	BHAGCHANDANI MAYURIKUMARI	
5	19SP02PT041	JANI ISHIKA KALPESH	

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Sateesh Birada
Date: 2024.05.
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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Ashutosh Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 5 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.
Student list: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT027	RAJPUROHIT CHANDRA	1 TO 5
2	19SP02PT049	KHUNT DENISHA SURESHBHAI	
3	19SP02PT051	SAVALIYA FORAMBEN RAJESHBHAI	
4	19SP02PT013	MANGROLIYA JEMINA AJAYKUMAR	
5	19SP02PT007	AKOLIYA SRUSHTIBEN	

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Date: 2024.05.16 10:52:26+05'30'

P P SAVANI
UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
OH NazarAyurved Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PPSavani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 15 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P PSavani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT002	SOJITRA DHRUVISHA BHARATBHAI	9 TO 12:30 & 3:30 TO 6
2	19SP02PT009	KATRODIYA RUTUKUMARI	
3	19SP02PT017	PATEL MEET	
4	19SP02PT025	MANGUKIYA SHELJA	
5	19SP02PT042	PANARA PRIYANKA	
6	19SP02PT044	VIRADIYA VRUNDABEN	
7	19SP02PT052	SAVALIYA TITHI	

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Date: 2024.05.16 10:52:26+05'30'

8	19SP02PT056	DONGA DAYA	
9	19SP02PT061	PATEL YUTI JANAKBHAI	
10	19SP02PT062	DESAI SHUBHAM	
11	19SP02PT065	VAGHANI HENCY	
12	19SP02PT006	MEHTA BRINDA	
13	19SP02PT011	PANCHOLI RIYA	
14	19SP02PT014	PATEL PRACHI	
15	19SP02PT032	PAGHADAL TANVIBEN	

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Sateesh Birad
Date: 2024.05
10:52:26+05'3

P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biitech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083 Date: 09/04/2023

To,
Administrator
Diamond Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 7 students for clinical posting, 4 students will come in Morning and 3 students will come in Evening. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT047	SHINGALA HINALEE	9 TO 2:30
2	19SP02PT058	DALIYA HEMANSHI	
3	19SP02PT060	GABANI NISHTHA	
4	20SP08PT004	LATHIYA KHUSHI	
5	19SP02PT033	JASANI RADHIKA	2:30 TO 8
6	19SP02PT050	BALAR KHUSHI	
7	19SP02PT010	DABHI MANSI	

Digitally signe
Sateesh Birad
Date: 2024.05
10:52:26+05'3

P P SAVANI
UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Fortis Hospital,
Mumbai.

Subject: Seeking permission for Clinical posting of BPT students of PPSavani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 2 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P PSavani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Students list: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT034	SHAH DEESHA ASHISH	9 to 5 PM
2	19SP02PT064	SHARMA CHANDAN BASANT	

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Jai Jhulelal Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PPSavani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 4 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P PSavani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT008	PATEL MANUSHI MUKESHBHAI	9 TO 1 & 4 TO 8
2	19SP02PT003	RAVAL VANSHI MUKESHBHAI	
3	19SP02PT024	RANA PALAK SANJAYBHAI	
4	19SP02PT031	PARMAR MANSI DHARMEDRASINH	

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P P SAVANI
UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
K P Sanghvi Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 4 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT028	HARSHITA KAWA	11 TO 5
2	19SP02PT030	PATEL GRESHI RAJESH	
3	19SP02PT035	HENI JADAV	
4	19SP02PT019	LOONAT ARINA	

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083 Date: 09/04/2023

To,
Administrator
Prannath Hospital (Amroli),
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PPSavani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 1 student for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P PSavani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Student list: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT012	VAGHELA DHAVAL RAJESHBHAI	9 TO 2

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Prannath Hospital (VED),
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 6 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT021	SUTARIYA JENI	8 TO 2
2	19SP02PT004	NADA NIRALI	
3	19SP02PT043	SANGHANI PINAL	
4	19SP02PT046	SUTARIYA JANVI	
5	19SP02PT059	MAVANI KHUSHI	
6	19SP02PT038	VARASADA PARLIKUMARI	

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Sanjeevani Hospital,
Mumbai.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 2 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT040	JANI RIDDHI JANAK	2 TO 8 PM
2	19SP02PT036	PANDEY VIVEK SATYAPRAKASH	

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083

Date: 09/04/2023

To,
Administrator
Sardar Patel Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PPSavani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 4 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P PSavani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Studentslist: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT022	ELSA THOMAS FERNANDES	9 TO 4
2	19SP02PT039	PATEL TASNIM IMTIYAZ YUSUF	
3	19SP02PT001	PATEL AASIYA FARUQBHAI	
4	19SP02PT045	PRAJAPATI JINALBEN BALDEVBHAI	

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P P SAVANI UNIVERSITY

P P SAVANI SCHOOL OF PHYSIOTHERAPY

NH 8, GETCO, Near Biltech, Village: Dhamdod, Kosmba, Ta: Mangrol, Dist: Surat-394125.

No:PPSU/PHY/(23)/1083 Date: 09/04/2023

To,
Administrator
Spandan Multispeciality Hospital,
Surat.

Subject: Seeking permission for Clinical posting of BPT students of PP Savani University

Respected Sir,

As per the subject cited above, we would like to send our BPT students to your esteemed hospital for clinical posting as a part of their Academic curriculum from time to time as per mutually agreed schedule.

In this month, we would be sending our BPT Eighth Semester students from 10th April to 9th May 2023 for clinical posting. There will be a batch of 4 students for clinical posting. Mentioning their names and the timings below.

Kindly give us permission and oblige.

Thanking you in anticipation.

Principal
P P Savani School of Physiotherapy
Kosamba.

P.P. SAVANI SCHOOL OF PHYSIOTHERAPY

Note: Any holidays will be intimated 2-3 days prior.

Students list: -

Sr. No.	Enrollment nub.	Name	Timing
1	19SP02PT015	PATEL MITALI TANSUKHLAL	9 TO 3 PM
2	19SP02PT053	PATEL MIRALI TANSUKHLAL	
3	19SP02PT054	RAUT ROSHNIBEN HARESHBHAI	
4	19SP02PT016	PATEL KAUSHANGI VIJAYBHAI	
5	19SP02PT005	PAREKH NISHTHA SAURABH	

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PPSU
P P SAVANI UNIVERSITY

Employers' Feedback Form - Feedback Analysis Report During the Academic Year 2022-23

S. No.	Question's	Excellent	Very Good	Good	Fair	Poor	Total Weightage	Percentage	3-Scale Weightage
1	How relevant do you think the courses are to the program?	43	36	5	0	0	374	89.05%	2.67
2	How would you rank the courses' general curriculum in relation to your needs for organizational competency?	24	49	11	0	0	349	83.10%	2.49
3	Do you think the competences and abilities from the designed curriculum are applicable to the demands of the industry?	19	34	31	0	0	324	77.14%	2.31
4	How would you rank the in terms of the specialized streams offered by the institution?	28	21	35	0	0	329	78.33%	2.35
5	How would you rank the distribution of contact hours (L-T-P) and credits among the courses?	32	23	29	0	0	339	80.71%	2.42
6	How do you think the elective offerings compare to the developments in the industry?	24	39	21	0	0	339	80.71%	2.42
7	Do you believe that the students enrolled in your program have accomplished program-specific outcomes that are unique to the needs of the industry?	28	28	28	0	0	336	80.00%	2.4
8	If our students who are employed by your company have shown that they possess professional abilities, such as communication and ethics.	21	38	25	0	0	332	79.05%	2.37
9	How relevant do you think students' practical knowledge is to the application in real life?	28	29	27	0	0	337	80.24%	2.41
10	Taking into account the course design, rate the courses in terms of additional learning or self-learning.	43	28	13	0	0	366	87.14%	2.61
				AVERAGE SCORE			342.50	81.55%	2.45

Authorized Signature

Authorized Person

Registrar
P P Savani University

P P SAVANI UNIVERSITY

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ACTION TAKEN REPORT

Employers		
S. No.	**Suggestions**	**Action Taken**
1	Competences and abilities from the designed curriculum are applicable to the demands of the industry	❖ The matter was taken in BOS meeting and curriculum was amended to include ability enhancement courses and skill enhancement courses. ❖ The skill enhancement courses included SSBT1140-Work Smarter with MS Word in Sem-2, TNPC3010-Corporate grooming and etiquettes and TNPC3020-Creativity, problem solving and innovation. ❖ The ability enhancement courses to includeCFLS2130-Intermediate Communicative English, CFLS2140-Upper Intermediate Communicative English, CFLS3110-Advanced Communicative English, courses were added in Semester 1, 2, and 3, respectively for the curriculum of B.Sc. Microbiology, CFLS7110-Professional&Academic Communication in Sem 2 of M.Sc. Microbiology. ❖ Mandatory Internships at industry
2	Do you think the competences and abilities from the designed curriculum are applicable to the demands of the industry	❖ Curriculum were designed as per the demands of Industry, still the input from clinical therapist will be taken in next BOS meeting.
3	Student's Professionalism in terms of Communication and Ethics	❖ The matter was raised in the BOS meeting, and actions were executed in line with the meeting's determinations. ❖ The topic related to professionalism and communication was added as subject.
4	Course is accomplished program-specific outcomes that are unique to the needs of the industry	❖ Students are sent to industry to get exposure of practical aspect of what they are studying at university

P SAVANI UNIVERSITY

Registrar

Registrar
P P Savani University

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1.4.2 FEEDBACK PROCESS OF THE INSTITUTION MAY BE CLASSIFIED AS:

OPTIONS (OPT ANY ONE THAT IS APPLICABLE):

EVIDENCES FOR ACTION TAKEN REPORT ON EMPLOYER

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B.Sc (MB)

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P P SAVANI UNIVERSITY

SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.Sc. Sem-1 (BT/MB) Batch Batch 2023

Sem	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme: Contact Hours				Total Credit	Examination Scheme: Theory								Practical						Tutorial						Total
										Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			
					Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
1	SSBT1010	Introduction to Biotechnology I	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT1020	Introduction to Biotechnology II	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT1030	Biotechnology Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB1070	Introduction to Microbiology I	Major Course	MB	3	0	0	3	3	3	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB1020	Introduction to Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB1030	Microbiology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSES1010	Introduction to Environment Science I	Allied Course	ES	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSES1020	Chemistry I	Allied Course	ES	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSES1030	Environment & Chemistry Practical I	Allied Course	ES	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	CFLS2130	Intermediate Communicative English	AEC	CLS	3	0	0	3	3	3	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100

Examination Coordinator, School of Sciences

(Dr. Anish Kumar Sharma)

I/C Principal, School of Sciences

P. P. SAVANI SCHOOL OF SCIENCES
PPSU SURAT

(Dr. Satish Biradar)

RegistrarPPSU

P P SAVANI UNIVERSITY

SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.Sc. Sem-4 (MB)

Year	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme					Examination Scheme																			
										Theory								Practical						Tutorial						
					Contact Hours				Total Credit	Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			Total
					Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
2	SSBT2020	Instrumentation & Techniques	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2040	Bioanalytical Techniques	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2060	Bioanalytical Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSBT2080	Molecular Biology I	Major Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2100	Molecular Biology II	Major Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2120	Molecular Biology Practical	Major Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB2040	Virology I	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB2060	Virology II	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB2080	Virology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	TNPC3020	Creativity, Problem Solving & Innovation	SEC	TNPC/SCHOOL	2	0	0	2	2	2	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100
		VAC Elective 2	VAC	CLSC	2	0	0	2	2	2	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100
		SEC Elective 1	SEC	CLSC	2	0	0	2	2	2	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100

24

FOR

Examination Coordinator,
School of Sciences

(Dr. Anish Kumar Sharma)
I/C Principal, School of Sciences

P. P. SAVANI SCHOOL OF SCIENCES
PPSU
SURAT

(Dr. Satish Biradar)
Registrar
PPSU

P. P. SAVANI UNIVERSITY

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PP SAVANI UNIVERSITY

SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.SC. Sem-5 MB

Year	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme					Examination Scheme																		
					Contact Hours				Total Credit	Theory						Practical						Tutorial						Total
					Theory	Practical	Tutorial	Total		Credit	CE	Passing	ESE	Passing	CE+ECE Passing	Credit	CE	Passing	ESE	Passing	CE+ECE Passing	Credit	CE	Passing	ESE	Passing	CE+ECE Passing	
3	SSMB3070	Food & Dairy Microbiology I	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3090	Food & Dairy Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3110	Food & Dairy Microbiology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3130	Industrial Microbiology I	Major Course	MB	3	0	0	3	3	3	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3150	Industrial Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3170	Industrial Microbiology practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSBT3130	Recombinant DNA Technology I	Minor Course	BT	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3150	Recombinant DNA Technology II	Minor Course	BT	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3170	Recombinant DNA Technology Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3010	Mycology I	Major Course	MB	3	0	0	3	3	3	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3030	Mycology II	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3050	Mycology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100

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Examination Coordinator,
School of Sciences

P. SAVANI SCHOOL OF SCIENCES PPSU SURAT

(Dr. Anish Kumar Sharma)
I/C Principal, School of Sciences

P. SAVANI UNIVERSITY

(Dr. Satish Biradar)
Registrar
PPSU

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P P SAVANI UNIVERSITY

SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.SC. Sem-6 (MB)

Year	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme					Examination Scheme																			
					Contact Hours				Total Credit	Theory								Practical						Tutorial						
										Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			Total
					Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
3	SSMB3020	Environmental Microbiology I	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3040	Environmental Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3060	Environmental Microbiology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSBT3140	Bioinformatics	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3160	IPR	Major Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3180	Bioinformatics Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3200	Project/Training/Report	Major Course	MB	0	8	0	8	4	0	0	0	0	0	0	0	0	4	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3220	Seminar	SEC	MB	0	6	0	6	3	0	0	0	0	0	0	0	0	3	40	0	60	24	40	0	0	0	0	0	0	100
	TNPC3010	Corporate Grooming & Ettiquette	SEC	TNPC	3	0	0	3	3	3	100	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100

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P P SAVANI UNIVERSITY
SCHOOL OF SCIENCES
TEACHING & EXAMINATION SCHEME FOR M.Sc. Sem-2 MB

ear	Course Code	Course Title	Offering Department	Teaching Scheme					Examination Scheme																			
									Theory								Practical							Tutorial						
				Contact Hours				Total Credit	Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			Total
				Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
	SSMB7020	Immunotechnology	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7040	Bioinstrumentation Techniques	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7060	Instrumentation & Immunotechnology Practical	MB	0	8	0	8	4	0	0	0	0	0	0	0	0	4	40	0	60	24	40	0	0	0	0	0	0	100
1	SSMB7080	Bioprocess Technology I	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7100	Enzyme Technology	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7120	Bioprocess & Enzymology Practical	MB	0	8	0	8	4	0	0	0	0	0	0	0	0	4	40	0	60	24	40	0	0	0	0	0	0	100
	CFLS7110	Professional & Academic Communication	CLS	3	0	0	3	3	3	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100

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SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.Sc. Sem-1 (BT/MB) Batch Batch 2023

	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme: Contact Hours: Theory	Practical	Tutorial	Total	Total Credit	Examination Scheme: Theory: Credit	Theory CE: Max.	Theory CE: Passing	Theory ESE: Sec I	Theory ESE: Sec II	Theory ESE: Max.	Theory ESE: Passing	Theory CE+ESE Passin	Practical: Credit	Practical CE: Max.	Practical CE: Passing	Practical ESE: Max.	Practical ESE: Passing	Practical CE+ESE Passin	Tutorial: Credit	Tutorial CE: CE	Tutorial CE: Passing	Tutorial ESE: ESE	Tutorial ESE: Passing	Tutorial CE+ESE Passin	Tota
	SSBT1010	Introduction to Biotechnology I	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	10
	SSBT1020	Introduction to Biotechnology II	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	10
	SSBT1030	Biotechnology Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	1
	SSMB1070	Introduction to Microbiology I	Major Course	MB	3	0	0	3	3	3	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	10
	SSMB1020	Introduction to Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	10
1	SSMB1030	Microbiology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	10
	SSES1010	Introduction to Environment Science I	Allied Course	ES	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSES1020	Chemistry I	Allied Course	ES	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSES1030	Environment & Chemistry Practical I	Allied Course	ES	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	FLS2130	Intermediate Communicative Englis	AEC	CLS	3	0	0	3	3	3	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100

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SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.Sc. Sem-4 (MB)

Year	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme					Examination Scheme																			
										Theory								Practical						Tutorial						
					Contact Hours				Total Credit	Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			Total
					Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
2	SSBT2020	Instrumentation & Techniques	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2040	Bioanalytical Techniques	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2060	Bioanalytical Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSBT2080	Molecular Biology I	Major Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2100	Molecular Biology II	Major Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT2120	Molecular Biology Practical	Major Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB2040	Virology I	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB2060	Virology II	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB2080	Virology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	TNPC3020	Creativity, Problem Solving & Innovation	SEC	TNPC/SCHOOL	2	0	0	2	2	2	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100
		VAC Elective 2	VAC	CLSC	2	0	0	2	2	2	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100
		SEC Elective 1	SEC	CLSC	2	0	0	2	2	2	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100

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SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.SC. Sem-5 MB

Year	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme					Examination Scheme																		
					Contact Hours				Total Credit	Theory						Practical						Tutorial						Total
					Theory	Practical	Tutorial	Total		Credit	CE	Passing	ESE	Passing	CE+ECE Passing	Credit	CE	Passing	ESE	Passing	CE+ECE Passing	Credit	CE	Passing	ESE	Passing	CE+ECE Passing	
3	SSMB3070	Food & Dairy Microbiology I	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3090	Food & Dairy Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3110	Food & Dairy Microbiology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3130	Industrial Microbiology I	Major Course	MB	3	0	0	3	3	3	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3150	Industrial Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3170	Industrial Microbiology practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSBT3130	Recombinant DNA Technology I	Minor Course	BT	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3150	Recombinant DNA Technology II	Minor Course	BT	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3170	Recombinant DNA Technology Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3010	Mycology I	Major Course	MB	3	0	0	3	3	3	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3030	Mycology II	Major Course	MB	2	0	0	2	2	2	40	0	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3050	Mycology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100

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Examination Coordinator,
School of Sciences

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SCHOOL OF SCIENCES

TEACHING & EXAMINATION SCHEME FOR B.SC. Sem-6 (MB)

Year	Course Code	Course Title	Category of Course	Offering Department	Teaching Scheme					Examination Scheme																			
					Contact Hours				Total Credit	Theory								Practical						Tutorial						
										Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			Total
					Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
3	SSMB3020	Environmental Microbiology I	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3040	Environmental Microbiology II	Major Course	MB	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB3060	Environmental Microbiology Practical	Major Course	MB	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSBT3140	Bioinformatics	Minor Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3160	IPR	Major Course	BT	2	0	0	2	2	2	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSBT3180	Bioinformatics Practical	Minor Course	BT	0	4	0	4	2	0	0	0	0	0	0	0	0	2	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3200	Project/Training/Report	Major Course	MB	0	8	0	8	4	0	0	0	0	0	0	0	0	4	40	0	60	24	40	0	0	0	0	0	0	100
	SSMB3220	Seminar	SEC	MB	0	6	0	6	3	0	0	0	0	0	0	0	0	3	40	0	60	24	40	0	0	0	0	0	0	100
	TNPC3010	Corporate Grooming & Ettiquette	SEC	TNPC	3	0	0	3	3	3	100	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100

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P P SAVANI UNIVERSITY
SCHOOL OF SCIENCES
TEACHING & EXAMINATION SCHEME FOR M.Sc. Sem-2 MB

ear	Course Code	Course Title	Offering Department	Teaching Scheme					Examination Scheme																			
									Theory								Practical							Tutorial						
				Contact Hours				Total Credit	Credit	CE		ESE					Credit	CE		ESE			Credit	CE		ESE			Total
				Theory	Practical	Tutorial	Total			Max.	Passing	Sec I	Sec II	Max.	Passing	CE+ESE Passing		Max.	Passing	Max.	Passing	CE+ESE Passing		CE	Passing	ESE	Passing	CE+ESE Passing	
	SSMB7020	Immunotechnology	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7040	Bioinstrumentation Techniques	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7060	Instrumentation & Immunotechnology Practical	MB	0	8	0	8	4	0	0	0	0	0	0	0	0	4	40	0	60	24	40	0	0	0	0	0	0	100
1	SSMB7080	Bioprocess Technology I	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7100	Enzyme Technology	MB	4	0	0	4	4	4	40	0	30	30	60	24	40	0	0	0	0	0	0	0	0	0	0	0	0	100
	SSMB7120	Bioprocess & Enzymology Practical	MB	0	8	0	8	4	0	0	0	0	0	0	0	0	4	40	0	60	24	40	0	0	0	0	0	0	100
	CFLS7110	Professional & Academic Communication	CLS	3	0	0	3	3	3	100	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	100

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School of Physiotherapy

Semester: - 8 | **Time Table from 09/04/2023**

Time		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:00-8:50	Subject Code & Subject	SPPT 4062 PT IN GENERAL MEDICAL & SURGICAL CONDITIONS	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4080 HEALTH CARE MANAGEMENT & ADMINISTRATION	SPPT 4080 HEALTH CARE MANAGEMENT & ADMINISTRATION	SPORTS
	Faculty Name	DrVrushika	DrVrunda	DrVrunda	DrSaloni	Dr Asha	
	Room No.	D-302	D-302	D-302	D-302	D-302	
8:50-9:40	Subject Code & Subject	SPPT 4062 PT IN GENERAL MEDICAL & SURGICAL CONDITIONS	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4062 PT IN GENERAL MEDICAL & SURGICAL CONDITIONS	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4080 HEALTH CARE MANAGEMENT & ADMINISTRATION	
	Faculty Name	DrVrushika	DrEkta Mehta	DrVrushika	DrVrunda	DrSaloni	Dr.Ekta
	Room No.	D-302	D-302	D-302	D-302	D-302	Sports Ground
9:40-9:50	**SHORT BREAK**						
9:50-10:45	Subject Code & Subject	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4120 CLINICAL PHYSIOTHERAPY PRACTICE	SPPT 4120 CLINICAL PHYSIOTHERAPY PRACTICE	SPPT 4120 CLINICAL PHYSIOTHERAPY PRACTICE	SPPT 4120 CLINICAL PHYSIOTHERAPY PRACTICE	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY
	Faculty Name	DrEkta Mehta	DrSameera	DrSameera	Dr Mona	Dr Mona	DrEkta
	Room No.	D-302	D-302	D-302	D-302	D-302	D-302
10:45-11:40	Subject Code & Subject	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES	SPPT 4080 HEALTH CARE MANAGEMENT & ADMINISTRATION	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES	SPPT 4120 CLINICAL PHYSIOTHERAPY PRACTICE
	Faculty Name	Dr Ashish Mathur	Dr Ashish Mathur	DrSaloni	Dr Ashish Mathur	Dr Ashish Mathur	DrEkta
	Room No.	D-302	D-302	D-302	D-302	D-302	D-302
	LUNCH						
12:35-1:30	Subject Code & Subject	SPPT 4080 HEALTH CARE MANAGEMENT & ADMINISTRATION	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES	SPPT 4062 PT IN GENERAL MEDICAL & SURGICAL CONDITIONS	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES	SPPT 4100 ALLIED & COMPLEMENTARY THERAPIES
	Faculty Name	Dr Asha	DrVrunda	Dr Ashish Mathur	DrVrushika	Dr Ashish Mathur	Dr Ashish Mathur
	Room No.	D-302	D-302	D-302	D-302	D-302	D-302
1:30-2:25	Subject Code & Subject	SPPT 4110 RESEARCH PROJECT	SPPT 4110 RESEARCH PROJECT	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4110 RESEARCH PROJECT	SPPT4070 PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT 4080 HEALTH CARE MANAGEMENT & ADMINISTRATION
	Faculty Name	DrEkta	Dr Ekta/Dr Vrunda	DrEkta Mehta	Dr Ashish/Dr Shifa	DrVrunda	Dr Asha
	Room No.	D-302	D-302	D-302	D-302		D-302
2:25-3:20	Subject Code & Subject	CLINICAL TRAINING (CASE PRESENTATION)	LIBRARY	SPPT 4110 RESEARCH PROJECT	CLINICAL TRAINING (CASE PRESENTATION)	SPPT 4110 RESEARCH PROJECT	
	Faculty Name	Dr Saloni/Dr Ashish Dr Shifa/ Dr Vrunda	DrEkta	Dr Asha/DrVrushika	Dr Mona/DrEkta Dr Asha/ DrVrushika	Dr Mona/DrSaloni	DrEkta
	Room No.	D-302	D-302	D-302	D-302	D-302	D-302

Subject	Code	Theory Hour	Practical Hour	Subject Coordinator	Subject Teacher
PT IN GENERAL MEDICAL & SURGICAL CONDITIONS	SPPT 4062	4	2	Dr Vrushika	Dr Shifa, Dr Vrushika
PREVENTIVE & COMMUNITY PHYSIOTHERAPY	SPPT4070	5	0	Dr Ekta	Dr Ekta, Dr Vrunda
ALLIED & COMPLEMENTARY THERAPIES	SPPT 4100	4	2	Dr Ashish	Dr Ashish
HEALTH CARE MANAGEMENT & ADMINISTRATION	SPPT 4080	4	0	Dr Asha	Dr Saloni, Dr Asha
RESEARCH PROJECT	SPPT 4110	0	4	Dr Ekta	All Faculties
EVIDENCE BASED PRACTICE	SPPT 4090	2	0	Dr Shifa	Dr Haribabu, Dr Shifa
CLINICAL PHYSIOTHERAPY PRACTICE	SPPT 4120	0	14	Dr Sameera	Dr Ekta, Dr Sameera

Dr Ekta Mehta

Class coordinator

Dr Hari Babu.K.V

Principal

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P P SAVANI UNIVERSITY

SCHOOL OF NURSING

TEACHING & EXAMINATION SCHEME

B.Sc. Nursing (2023 -24 Batch Onwards)

Semester	Course Code	Course Code	Course Title	Course Category	Offering Department	Teaching Scheme					Examination								
						Contact Hours				Total Credit	Theory								
						Theory	Practical / Studio	Tutorial / Skill Lab	Total		Credit	CE		ESE				CE+ESE Passing (50%)	Grade
												Max.	Passing (0%)	Sec-I	Sec-II	Max.	Passing (0%)		
1	SNNR1090	ANAT105 & PHY110	Applied Anatomy and Applied Physiology	Minor Course	Nursing	6	-	-	6	6	6	25	-	37	38	75	-	50	P
	SNNR1100	SOCI115 & PSYC120	Applied Sociology and Applied Psychology	Minor Course	Nursing	6	-	-	6	6	6	25	-	37	38	75	-	50	P
	SNNR1110	N-NF[1]125	Nursing Foundation-I	Major Course	Nursing	6	8	4	18	10**	8**	25*	-	-	-	-	-	0	-
	CFLS2130	ENGL101	Intermediate Communicative English	AEC	CFLS	3	-	0	3	3	3	100	40	-	-	-	-	40	P
						21	8	4	33	15	15								
2	SNNR1130	NUTR140 & BIOC135	Applied Biochemistry and Applied Nutrition and Dietetics	Minor Course	Nursing	5	0	0	5	5	5	25	-	25	50	75	-	50	P
	SNNR1140	N-NF[II]125	Nursing Foundation-I and II	Major Course	Nursing	6	16	6	28	13+10** =23	9+8** =17	25 +25*/2 =25	-	-	-	75	-	50	P
	SNNR1150	HNIT145	Health / Nursing Informatics and Technology	Multidisciplinary Course	Nursing	2	0	2	4	3	3	25	-	-	-	25	-	25	P
	CFLS2140		Upper Intermediate Communicative English	AEC	CFLS	2	0	0	2	2	2	100	40	-	-	-	-	40	P
						15	16	8	39	33	27								

*Note:

* - Semester I Nursing Foundation-I CE marks of Theory and Practical will be added to the CE of Nursing Foundation-II

** - Nursing Foundation-I Theory and Practical credits 8 and 2 respectively will be carry forward to semester-II and added in the Nursing Foundation-II subject

Total Nursing Foundation theory credit is 17 and practical credit is 6

Teaching: 20 weeks per semester

1. Evaluation of Theory: 1 Credit = 20 hour
2. Evaluation of Practical: 1 Credit = 60 hours
3. Evaluation of Skill Lab: 1 Credit = 40 hours
4. Evaluation of CFLS Courses Theory: 1 Credit = 15 hours
5. Evaluation of CFLS Courses Practical: 1 Credit = 30 hours

Signature Of Principal

PRINCIPAL
P.P. SAVANI SCHOOL OF NURSING
KOSAMBA, TA. MANGRL, SURAT-394 120

P.P. SAVANI SCHOOL OF NURSING

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SCHOOL OF NURSING

TEACHING & EXAMINATION SCHEME

B.Sc. Nursing (2023 -24 Batch Onwards)

Semester	Course Code	Course Code	Course Title	Course Category	Offering Department	Teaching Scheme					Examin								
						Contact Hours				Total Credit	Theory								
						Theory	Practical / Studio	Tutorial / Skill Lab	Total		Credit	CE		ESE				CE+ESE Passing (50%)	Gra
												Max.	Passing (0%)	Sec-I	Sec-II	Max.	Passing (0%)		
3	SNNR2100	MICRO 201	Applied Microbiology and Infection control including safety	Minor Course	Nursing	2	-	2	4	3	3	25	-	37	38	75	-	50	
	SNNR2110	PHAR(I)205 and PATH (I)210	Pharmacology I and Pathology I	Minor Course	Nursing	2	-	-	2	2**	2**	25*	-	-	-	-	-	-	
	SNNR2120	N-AHN(1)215	Adult Health Nursing I	Major Course	Nursing	7	24	2	33	14	8	25	-	-	-	75	-	50	
	CLSC2020		IPDC-I	VAC	CLSC	2	-	-	2	2	2	100	40	-	-	-	-	40	
						13	24	4	41	19	13								
4	SNNR2130	PHAR(II)205 and PATH (II)210	Pharmacology and Pathology (I & II) and Genetics	Minor Course	Nursing	4	-	-	4	4+2**=6	4+2**=6	25*	-	38	37	75	-	50	
	SNNR2140	N-AHN(1)225	Adult Health Nursing II	Major Course	Nursing	7	24	2	33	14	8	25	-	-	-	75	-	50	
	SNNR2150	PROF230	Professionalism, Ethics and Professional Values	VAC	Nursing	1	-	-	1	1	1	25	-	-	-	25	-	25	
			INC Elective Subject***	VAC	Nursing	1	-	-	1	1	1	50	-	-	-	-	-	20	
	CLSC2030		IPDC-II	VAC	CLSC	2	-	-	2	2	2	100	40	-	-	-	-	40	
			Life Skill Elective Courses	IKS	CLSC	2	-	-	2	2	2	100	40	-	-	-	-	40	
						17	24	2	43	26	20								

*Note:

Life Skill Elective Courses
CLSC2040: Life Skill Lesson From Bhagvat Gita
CLSC2050: Learning from Ramayana
CLSC2060: Indian Heritage & Culture
CLSC2070: Indian Classical Music
CLSC2080: Indian Classical Dance
CLSC2090: Constitutional Empowerment
CLSC2100: Indian Agriculture
CLSC2110: Indian Health Science
CLSC2120: Indian Architecture and Town Planning

*** - Elective INC Subject
SNNR2160 - Human Values
SNNR2170 - Diabetes care
SNNR2180 - Soft Skills

* - Semester 3 Pharmacology-I and Pathology I CE marks of Theory will be a

** - Pharmacology-I and Pathology I Theory 2 credits will be carry forward to

Total Pharmacology & Pathology and Genetics theory credit is 6

Teaching: 20 weeks per semester

1. Evaluation of Theory: 1 Credit = 20 hour
2. Evaluation of Practical: 1 Credit = 80 hours
3. Evaluation of Skill Lab: 1 Credit = 40 hours
4. Evaluation of CFLS Courses Theory: 1 Credit = 15 hours
5. Evaluation of CFLS Courses Practical: 1 Credit = 30 hours

Signature Of Principal

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EVENT REPORT

Date of event:	**11th April 2023**	**Reporter's details:**	**Name: Ms. Amrita Das** **Designation: Assistant Professor** **Mob: 9558106303** **Email: amrita.das@ppsu.ac.in**

Name and Type of Event : Panch Prakalp Event	**Event title: Essay Writing Competition** **Organized by: Panch Prakalp Coordinator**
No of participants	**12**

1. **Attendee: Students of SLM**

2. **Venue: B-building, classroom no.3**

3. **Event outline:** An Essay writing competition was organized on 11th April 2023 by the SLM Panch Prakalp Coordinator Ms. Amrita Das. The theme of the competition was G-20 and the topic of the competition was Anti-corruption. Total 12 students participated in the event. Student coordinator Ms. Shweta Mishra, MBA sem 2 coordinated to make it smooth. Prof.Aparna Vajpayee and Dr. Queen Sarkar Banerjee joined the event as judges.

4. **Outcome of event-** The event was well planned and was executed smoothly.

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5. **Photo -**

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EVENT REPORT

Date of event:	**27th March to 31st March 2023**	**Reporter's details:**	**Name: Ms. Sayyeda Jatniwala** **Designation: Assistant Professor** **Mob: 8866393292** **Email: sayyeda.jatniwala@ppsu.ac.in**

Name and Type of Event: Food Wastage Awareness Campaign, Social Cause	**Event Title: Food Wastage Awareness Campaign**
No of participants	**13**

1. **Attendees:** Students and staff of various schools of the University

2. **Venue:** PPSU Canteen

2. **Event outline:** The student Innovation Cell of the School of Liberal Arts and Management Studies carried out a campaign from 27/03/2023 to 31/03/2023 in the university's canteen. Team of students - Shweta Mishra, Mansi Rajpurohit, Janvi Lakhani from MBA 2, Jay Rathod, Kautilya Rao, Akshay Rawal, Gaurang Kanzariya, Smith Patel from BCom 4, Vishwa, from BBA 2, Rishi Modi, Shyam Karia, and Ivine from Bcom 2 gave their heart and soul in educating everyone about stopping food wastage. They pasted banners and posters in the canteen area along with that they appreciated students who completed their food with smiley batch as a token of appreciation for these 5 days. On the last day, they made students fill out feedback forms. They also dug a pit in the area behind the canteen where they put organic waste in order to make fertilizer.
3. **Outcome of event:** Reduction in food wastage

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4. **Photo:**

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Alumni Feedback Form - Feedback Analysis Report During the Academic Year 2022-23

S. No.	Question's	Excellent	Very Good	Good	Fair	Poor	Total Weightage	Percentage	3-Scale Weightage
1	1. The syllabus content increases students' comprehension of important management functional areas, satisfies industry demands, and closes the knowledge gap between academics and industry standards and contemporary worldwide scenarios.	117	91	56	11	5	1144	81.71%	2.45
2	Current issues, global issues, and emerging national and worldwide management trends are adequately covered in the current syllabus.	103	89	66	15	7	1106	79.00%	2.37
3	The objectives of education correspond with the needs of the job market.	112	76	71	15	6	1113	79.50%	2.39
4	The program gives skill development adequate attention.	106	97	57	16	4	1125	80.36%	2.41
5	The significance of ethics, professionalism, and human values is adequately emphasized.	108	94	61	14	3	1130	80.71%	2.42
6	The curriculum makes recommendations for suitable teaching and learning approaches.	103	90	71	11	5	1115	79.64%	2.39
7	Innovative methods of instruction and learning are used.	109	94	59	13	5	1129	80.64%	2.42
8	There are opportunities for real-time implementation within the curriculum.	107	84	65	15	8	1104	78.86%	2.37
9	A thorough explanation of the evaluation (examination) process is provided.	113	85	64	14	4	1129	80.64%	2.42
10	The weighting for continuing, continuous Evaluation (internal assessment) is sufficient.	111	91	61	12	5	1131	80.79%	2.42
						AVERAGE SCORE	**1,122.60**	**80.19%**	**2.41**

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Authorized Person

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ACTION TAKEN REPORT

Alumni		
S. No.	**Suggestions**	**Action Taken**
1	Utilize the Alumni association for students of PPSU	❖ As per suggestions from Alumni's, seminars, talks, and guidance sessions were arranged. Alumni also supported by contributing academic related things.

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1.4.2 FEEDBACK PROCESS OF THE INSTITUTION MAY BE CLASSIFIED AS:

OPTIONS (OPT ANY ONE THAT IS APPLICABLE):

EVIDENCES FOR ACTION TAKEN REPORT ON ALUMNI

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Event Report

Alumni Project Mentorship Workshop

Date: 20/04/2023

Venue: C-012, Class Room

Time: 09.00 AM Onwards

Introduction:

The Alumni Project Mentorship Workshop, organized by School of Engineering, PPSU provided a platform for alumni to mentor current students in their project endeavors. The workshop aimed to facilitate collaboration, knowledge sharing, and mentorship opportunities between alumni and students, fostering a sense of community and support within the university ecosystem.

Workshop Activities:

The workshop commenced with a brief introduction, followed by project matching sessions where alumni were paired with student project teams based on their expertise and interests. Mentorship sessions allowed for one-on-one or group interactions, enabling alumni to provide guidance, feedback, and support to students. Networking breaks and a post-event mixer provided additional opportunities for attendees to connect and build relationships.

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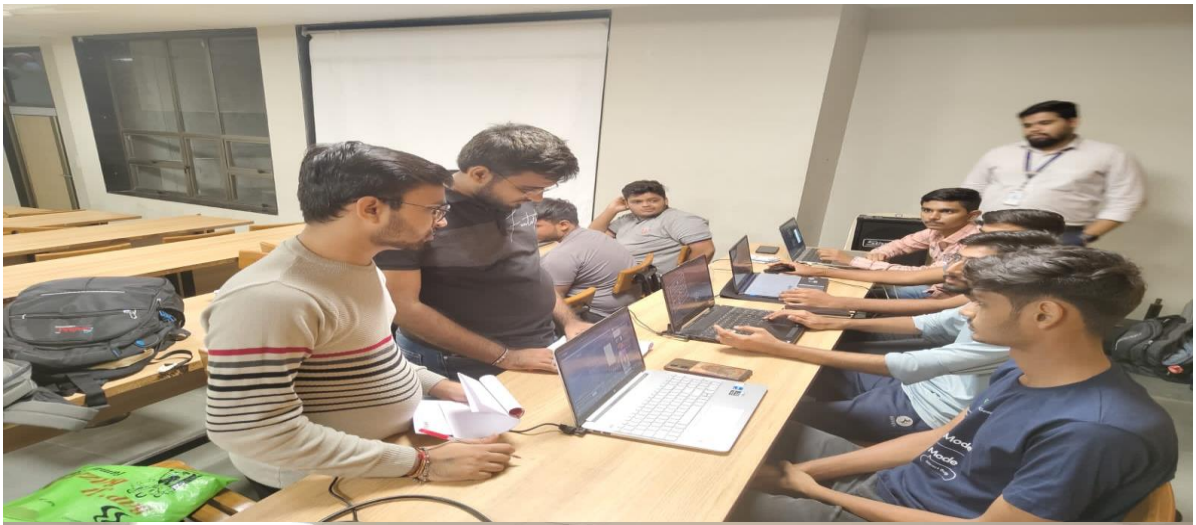
Impact and Feedback:

Feedback from participants indicated that the workshop was highly beneficial, with both alumni and students expressing appreciation for the opportunity to collaborate and learn from each other. Alumni mentors found the experience rewarding, while students valued the guidance and insights provided by experienced professionals. The workshop facilitated meaningful connections and laid the groundwork for potential future collaborations.

Conclusion:

The Alumni Project Mentorship Workshop was a success, demonstrating the value of alumni engagement and mentorship in enhancing the educational experience and professional development of students. The workshop fostered a sense of community and collaboration within the university, highlighting the importance of leveraging alumni expertise to support the next generation of leaders and innovators.

Glimpse of Event:



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Event Report

Alumni Engagement Activity: Expert Talk

Date: 23/03/2023

Venue: University Auditorium

Time: 10.00 AM to 11.30 AM

Introduction:

The Alumni Engagement Activity: Expert Talk, hosted by School of Engineering, P P Savani University, brought together alumni, students, and professionals for an enriching discussion on navigating success in today's dynamic professional landscape. The event featured esteemed alumni sharing their insights and experiences, providing valuable guidance to attendees.

Key Highlights:

The event commenced with a warm welcome address, followed by an engaging presentation by Mr. Dhruv Gandhi, SDE-2 at DhiWise Pvt Ltd. Dhruv shared his personal journey, highlighting the challenges he faced and the strategies he employed to achieve success in the software development industry. Attendees actively participated in the Q&A session, seeking advice from Dhruv on various career-related topics. Networking opportunities allowed for meaningful connections to be made among attendees, fostering collaboration and mentorship within the community.

Impact and Feedback:

The Expert Talk received positive feedback from attendees, who expressed appreciation for the valuable insights shared by the alumni. Many participants found the event to be inspirational and informative, with some highlighting specific strategies they plan to implement in their own careers. The networking aspect of the event was also well-received, providing attendees with an opportunity to expand their professional networks and connect with like-minded individuals.

Conclusion:

The Expert Talk was a resounding success, reaffirming P P Savani University's commitment to fostering alumni engagement and supporting the professional development of its community members. The event served as a platform for meaningful dialogue, knowledge sharing, and networking, leaving attendees feeling inspired and empowered to pursue their career aspirations.

Glimpse of Event:

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EXPLORE
EXPERIENCE
EMPOWER

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Professional Feedback Form - Feedback Analysis Report During the Academic Year 2022-23

S. No.	Question's	Excellent	Very Good	Good	Fair	Poor	Total Weightage	Percentage	3-Scale Weightage
1	What is your opinion about Academic Programs offered in the Institutions.	76	48	4	0	0	584	91.25%	2.74
2	How did you find Communication with the Institute Members?	49	58	21	0	0	540	84.38%	2.53
3	Rate your experience with Students Representations in Academic Bodies.	49	58	20	1	0	539	84.22%	2.53
4	Coverage of the Core and Elective Paper in the Curriculum in respect to the Program.	38	45	42	3	0	502	78.44%	2.35
5	How did you find Selection of Elective Papers according to the Societal needs?	39	44	42	3	0	503	78.59%	2.36
6	Rate Standards of the Syllabus Framed for each Programs.	40	46	40	2	0	508	79.38%	2.38
7	How you did find The Standard of Questions in the University Examinations?	41	52	34	1	0	517	80.78%	2.42
8	Fairness in the conduct of Practical/ Theory/ Tutorial/ other Examinations.	42	49	34	3	0	514	80.31%	2.41
9	Safety inside the Campus.	50	57	20	1	0	540	84.38%	2.53
10	Rate about Campus Maintenance.	56	52	20	0	0	548	85.63%	2.57
11	Rate the Hospitality have been Provided.	63	47	15	3	0	554	86.56%	2.6
12	How did you feel Safety Inside the Campus?	61	38	28	0	1	542	84.69%	2.54
13	Rate the Infrastructure of P P Savani University.	59	47	21	1	0	548	85.63%	2.57
14	Transportation Facility from the Campus to the City.	38	54	33	3	0	511	79.84%	2.4
15	Attitude of the Students Perceived by You.	50	45	32	1	0	528	82.50%	2.48
						AVERAGE SCORE	531.87	83.10%	2.49

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ACTION TAKEN REPORT

Professionals		
S. No.	**Suggestions**	**Action Taken**
1	Enhancing teachers' quality and teaching pedagogy	❖ The matter was raised in the BOS meeting and teachers were asked to complete FDP for improve the quality of teaching and also their skill enhancement.
2	Re-structuring the research related activities	❖ As per suggestions by Professionals we have gave opportunities in research related projects to the faculty members the NGO's

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1.4.2 FEEDBACK PROCESS OF THE INSTITUTION MAY BE CLASSIFIED AS:

OPTIONS (OPT ANY ONE THAT IS APPLICABLE):

EVIDENCES FOR ACTION TAKEN REPORT ON PROFESSIONAL

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CERTIFICATE

of Appreciation

This certificate is proudly presented to

ANJALIBEN K. PADHIYAR

for attending Five Days Training Program on "**Soft Skills & Personality Development**" organized from 15/05/2023 to 19/05/2023 at P P Savani University

CONVENOR

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CERTIFICATE

of Appreciation

This certificate is proudly presented to

KULDEEP YADAV

for attending Five Days Training Program on "**Soft Skills & Personality Development**" organized from 15/05/2023 to 19/05/2023 at P P Savani University

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CERTIFICATE

of Appreciation

This certificate is proudly presented to

ADITI J. MANKAD

for attending Five Days Training Program on "**Soft Skills & Personality Development**" organized from 15/05/2023 to 19/05/2023 at P P Savani University

CONVENOR

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CERTIFICATE

of Appreciation

This certificate is proudly presented to

MOHAMEDFAIYAZ A. SHAIKH

for attending Five Days Training Program on "**Soft Skills & Personality Development**" organized from 15/05/2023 to 19/05/2023 at P P Savani University

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P P Savani Homoeopathic Medical College and Hospital

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CERTIFICATE

OF PARTICIPATION

Proudly Presented To

Dr. Amit Dhavalikar Professor

For active participation during the conduct of the **"Five Days Continuing Education Program for Teachers on Research Methodology in Homoeopathy."** From 24/04/2023 to 28/04/2023 at the P P Savani Homoeopathic Medical College & Hospital.

Coordinator

Principal

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P P Savani Homoeopathic
Medical College and Hospital

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OF PARTICIPATION

Proudly Presented To

Dr. Nehal suther Associate Professor

For active participation during the conduct of the **"Five Days Continuing Education Program for Teachers on Research Methodology in Homoeopathy."** From 24/04/2023 to 28/04/2023 at the P P Savani Homoeopathic Medical College & Hospital.

Coordinator

Principal

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OF PARTICIPATION

Proudly Presented To

Dr. Yamini Soni Assistant Professor

For active participation during the conduct of the **"Five Days Continuing Education Program for Teachers on Research Methodology in Homoeopathy."** From 24/04/2023 to 28/04/2023 at the P P Savani Homoeopathic Medical College & Hospital.

Coordinator

Principal

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No: **DST/INSPIRE/03/2022/005448**

GOVERNMENT OF INDIA
MINISTRY OF SCIENCE and TECHNOLOGY
Department of Science and Technology
Technology Bhawan, New Mehrauli Road
New Delhi-110016

Date: 14 March, 2023

Subject: Provisional Offer for consideration of INSPIRE Fellowship-2022 application at Level II evaluation for its consideration for award of INSPIRE Fellowship.
[DST/INSPIRE/03/2022/005448]

Dear Vivek Savani **,**

This is with reference to your application submitted against the "Call for Applications" for award of INSPIRE Fellowship-2022. In this regard, it is informed that your application has been provisionally short-listed for Level-II evaluation for its consideration for award of INSPIRE Fellowship. This Provisional Offer will be valid for one year from the date of issue. The final selection for award of Fellowship will be subject to the following:

1) Your gaining admission into a doctoral (Ph.D.) programme in the any recognized University/ Institute of the country within one year from the date of issue of this offer, and,
a) On the result of Level II evaluation of your application by domain experts which will be based on academic merit, research profiles of the host Department/Institution and Research Supervisor and quality of the detailed Research Proposal. For selection, an applicant has to secure a minimum of 60 out of 100 marks. **Kindly note that this Provisional Offer does not guarantee award of the INSPIRE Fellowship.**

2. The value of the Fellowship will be at par with the Junior Research Fellowship (JRF)/ Senior Research Fellowship (SRF) of Government of India along with a Contingency grant. The Fellowship shall be tenable for a maximum period of five years or completion of the doctoral (Ph.D.) degree programme or date of Ph.D. viva voce examination, whichever is earlier.

3. After gaining admission into Ph.D. programme in any recognized University/ Institute, you need to prepare a detailed research proposal for Ph.D. programme which is feasible to carry out in the given host institution. Kindly upload:

1. the Ph.D. admission related documents along with Endorsement Certificate (Endorsement Certificate template is available in your dashboard on the online portal),
2. ii) your detailed Research Proposal to be pursued during the doctoral research, and
3. iii) CV of your proposed Research Supervisor, through your account on the online INSPIRE Web-Portal https://online-inspire.gov.in. **Please ensure that scanned document(s) uploaded on the portal should be clearly readable.**

4. Please note that once you submit these documents, there will be no scope to alter the uploaded documents on the web-portal unless they are reverted/rejected by DST. Students are advised to upload these documents within one month of gaining admission into the Ph.D. Programme. Terms and Conditions are also available at the Web-Portal: https://online-inspire.gov.in/Content/GuideLine/FellowShipGuidelines.pdf.

5. Final Offer for award of INSPIRE Fellowship will be subject to recommendation at Level-II Evaluation to be done by Domain Experts and subject to the availability of seats under the INSPIRE Fellowship Scheme in the respective year.

6. If you do not confirm your Ph.D. admission and not submit your research proposal within the valid period of one year from the date of issue of provisional offer, the validity of this Provisional Offer will automatically get terminated. Accordingly, online portal will get automatically closed and it will not be possible to upload any document. There is no scope for extending the validity period of this Provisional Offer. Documents submitted as e-mail attachments or any other mode shall not be entertained, as the complete process is online.

7. In the event of being found ineligible due to any reason at any stage (including unintentional computer/printer's error etc.) for award of the INSPIRE Fellowship, the Provisional Offer shall stand withdrawn.

Thanks & Regards,

Dr. D. V. Phani Kumar
Scientist 'D'
For further information, please contact INSPIRE Support Team Phone no. 0124-6690020/21 (Mon-Fri: 09:30 AM to 5:30 PM) or email us at inspire.prog-dst@nic.in

Vivek Savani
C/O : Mukeshbhai Savani
Address : 12, Subhash Nagar Soc-1 Nr. Kanatreshwar Temple, Katargam
City : Surat
State/UT: GUJARAT - 395004

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School of
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is proud of you!

Congratulations

Ms Ayesha Babar

B.Sc Sem 2, Biotechnology

for securing Second position in

33rd

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A State Level Competition
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Emerging trends in the recovery of ferrospheres and plerospheres from coal fly ash waste and their emerging applications in environmental cleanup

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Coal fly ash (CFA) is a major global problem due to its production in huge volumes. Fly ash has numerous toxic heavy metals; thus, it is considered a hazardous material. However, it also has several value-added minerals like ferrous, alumina, and silica along with other minerals. Fly ash also has several natural micro- to nano-structured materials; for instance, spherical ferrous-rich particles, cenospheres, plerospheres, carbon nanomaterials, and unburned soot. These micron- to nano-sized particles are formed from the molten slag of coal, followed by condensation. Among these particles, plerospheres which are hollow spherical particles, and ferrospheres which are ferrous-rich particles, have potential applications in the environmental cleanup, research, catalytic industries, and glass and ceramics industries. Additionally, these particles could be further surface-functionalized or purified for other applications. Moreover, these particles are widely explored for their potential in the army and other defense systems like lightweight materials and sensing The recovery of such particles from waste fly ash will make the process and remediation technology economically and environmentally friendly. The current review focuses on the various structural and elemental properties of ferrospheres and plerospheres from fly ash. This review also focuses on the emerging applications of both naturally formed materials in CFA.

KEYWORDS
coal fly ash, plerospheres, cenospheres, ferrospheres, ceramics

1 Introduction

Coal fly ash (CFA) is a fine spherical powder produced in thermal power plants (TPPs) during the burning of pulverized coal when generating electricity (Yadav and Fulekar, 2020) (Yadav et al., 2023a). Annually, a large amount of CFA is produced globally and is mainly dumped in the vicinity of thermal power plants (TPPs) (Yadav et al., 2022a). However, due to the rapid advancement in technology, CFA has gained importance in the fields of metallurgy, ceramics (dos Santos et al., 2014), civil applications (Marinina et al., 2021), building and construction (Mohammed et al., 2021), river and embankments, and agriculture (Yadav and Pandita, 2019). The utilization of CFA worldwide is gradually increasing annually. As per a 2022 report, the total global annual production was about 1.143 billion tons, with an average utilization rate of 60%. Several European and Asian countries, including China, also reached 100% CFA utilization rates, while developing countries like India are struggling with a 50%–60% utilization rate as per 2021–2022 data (Yadav et al., 2022a).

The source of CFA is coal, which has various organic and inorganic compounds that produce structurally diverse spherical particles upon burning in TPP furnaces (Yadav et al., 2021a). The structural diversity in CFA particles is due to combustion at high temperatures (1,400–1800°C) (Wang et al., 2021), which melts the content of the coal. Condensation and complex processes give rise to structurally and chemically diverse spherical particles ("*spheres*"). Such spherical particles could be rich in alumina and silica and are known as "*aluminosilicate spheres*" or "cenospheres" (Yadav et al., 2021b). Another spherical particle in CFA is "plerospheres," or spheres within spheres; i.e., larger spheres encapsulating several smaller spheres along with gases and mineral fragments (Chepaitis et al., 2011). Another type of sphere present in CFA is ferrospheres, which are ferrous-rich spherical particles. The size of all these spherical particles varies from 80 nm to several microns (20 μ) depending on the operating conditions of the TPPs (Yadav et al., 2022b). These spherical particles have applications in ceramics, construction, research, and environmental clean-up (Sharonova et al., 2015) and can be separated from CFA by several techniques, most commonly magnetic separation (Shoumkova, 2011; Gupta et al., 2022). For instance, magnetic fractions in CFA could be recovered by using an external magnet in wet or dry magnetic separation methods, while the rich non-ferrous fractions in plerospheres and cenospheres could be extracted using the sink-float technique, froth floatation technique, density-based separation, etc. Cenospheres are lighter in weight in comparison to ferrospheres and plerospheres (Noor-ul-Amin, 2014).

Generally, CFA has mainly 5%–15% ferrous fractions, while plerosphere content varies from 0.1 to 3.8 wt.%. In most cases, it is near 0.3–1.5 wt. %. In the last decade, ferrospheres have been used widely in ceramics, research, and other industries in comparison to plerospheres due to their easy recovery, wider applications in catalysis, etc. Contrary to ferrospheres, very limited information is available on plerospheres (Anshits et al., 2021). These structurally varied spherical particles have different structural and elemental properties and have started gaining importance in various applications (Goodarzi and Sanei, 2009). Several investigators have reported the recovery of CFA components like cenospheres, plerospheres, ferrospheres, and unburned carbon particles. For instance, Blissett and Rowson (2012) suggested the utilization of CFA for agriculture, zeolite synthesis, cement manufacturing, glass ceramics, geopolymers, etc. (Blissett and Rowson, 2012). Yao and colleagues demonstrated the importance of CFA in the synthesis of geopolymers, silica aerogels, carbon nanotubes (CNTs), etc. (Gollakota et al., 2019). Furthermore, Yao and team emphasized the recovery of alumina from CFA in China (Yao et al., 2014; Gollakota et al., 2019).

The present study mainly emphasized ferrospheres and plerospheres, due to their morphological and elemental properties that make them two distinct, naturally formed spherical ceramic particles in CFA in TPPs. We also described the detailed mechanism involved in the formation of both these spherical particles in the furnace during coal burning in TPPs. Another objective was to summarize the recent advances in the recovery of plerospheres and ferrospheres from CFA. The final objective was to emphasize the emerging applications of plerospheres and ferrospheres in the fields of environmental cleanup and military. More recent work in these fields will draw the attention of scientific investigators toward plerosphere recovery and new emerging applications.

2 Structurally important and value-added particles in CFA

The structurally different structures of CFA i.e., plerospheres (PS), ferrospheres (FS), cenospheres (CS), and irregular carbonaceous particles (Snellings et al., 2021), play specific roles in different fields like environmental cleanup, research, ceramics (dos Santos et al., 2014), fillers, and lightweight materials (Balapour et al., 2022), etc. Among microspheres in CFA, cenospheres are the most predominant, followed by ferrospheres and plerospheres (Liu et al., 2018). All these three microspheres constitute a specific fraction of the CFA that forms as a result of the burning of pulverized coal in the furnaces of TPPs. These microspheres are formed during combustion in the furnace at the stage of transformation of coal mineral compounds, as shown in Figure 1. The spherical shape is attributed to the cooling and solidification of CFA particles around the gases. These microspheres are mainly made up of aluminosilicate glasses, mullite, calcium silicates, sulfate, calcite ferrous oxides, and quartz (Baziak et al., 2021).

Silica dominates the solid phase of these microspheres, whose percentage is about 50%–65%, followed by alumina at 19%–65% and Fe_2O_3 at 0.7%–6.5%. In addition to this, it also has unburned carbons (UC) which are mainly composed of inorganic and organic carbon materials formed from the incomplete combustion of coal (Eisele and Kawatra, 2002; Song et al., 2021; Lv et al., 2022). These unburned particles contain char soot, polyaromatic hydrocarbons, and carbon nanotubes (CNTs) (Alam et al., 2021). Based on various reports, it was found that the UC content in CFA could vary from 3% to 12% but in some cases could also reach 20% (Liu et al., 2014). There are several reports where both single and multi-walled CNTs were found and isolated from CFA. In addition to this, a few

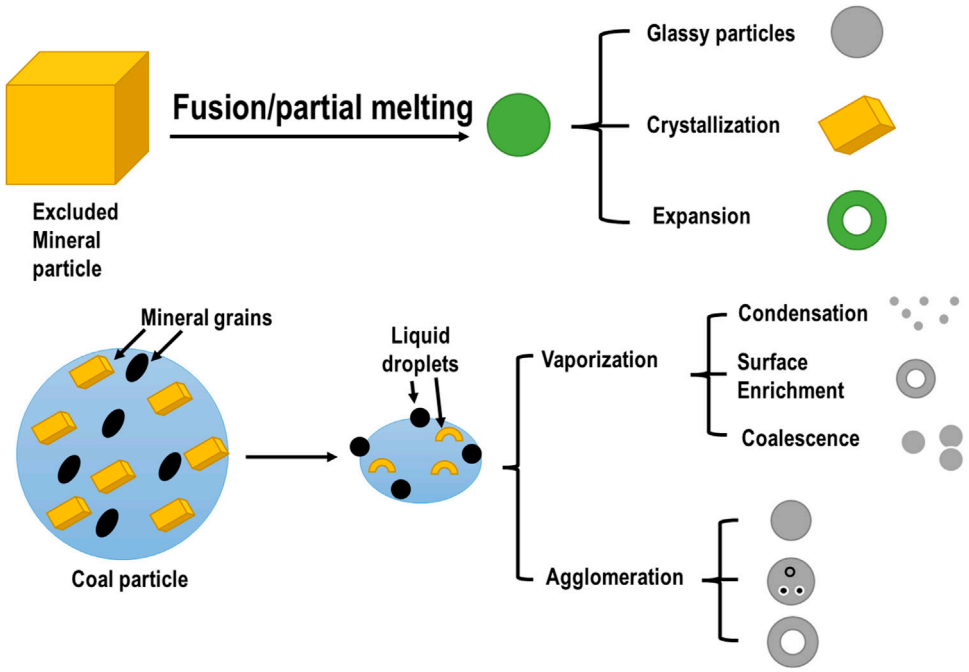

FIGURE 1
Generalized scheme of the transformation of coal mineral matter during combustion. Adapted and modified from Kutchko and Kim (2006).

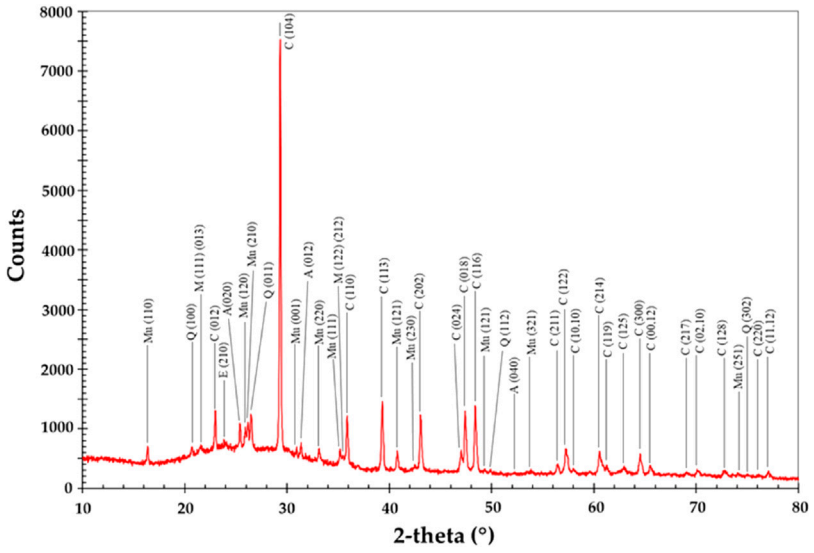

FIGURE 2
XRD of CS from lignite CFA of a Thailand TPP depicting their major minerals. Adapted from Yoriya and Tepsri (2020) and (Yoriya and Tepsri, 2021).

investigators have also reported the extraction of fullerene, nano-onions, and graphene from CFA (Das et al., 2016; Liu et al., 2016; Gnanamoorthy et al., 2021). Tiwari et al. (2016) reported the presence of fullerene-like aggregates in CFA (Tiwari et al., 2015). The presence of CNTs 18–24 nm in diameter in the Gondwana region CFA was reported by a group of investigators from India. Several investigators have also claimed the presence of carbon nanoballs in various CFAs from different parts of the globe, for instance, carbon nanoballs with sizes of 5–10 nm have been reported. In addition to these, numerous investigators have reported the presence and recovery of carbon onions, chars, and soots from the CFA samples using various techniques, with very high efficiency.

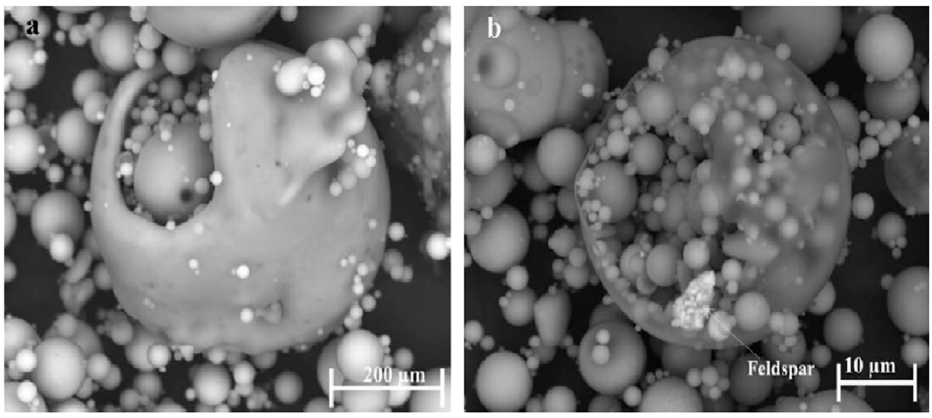

FIGURE 3
(A) SEM image of a thick-walled PS with a ruptured wall. **(B)** SEM image of a thin-walled PS with a ruptured wall. Adapted from Goodarzi and Sanei (2009).

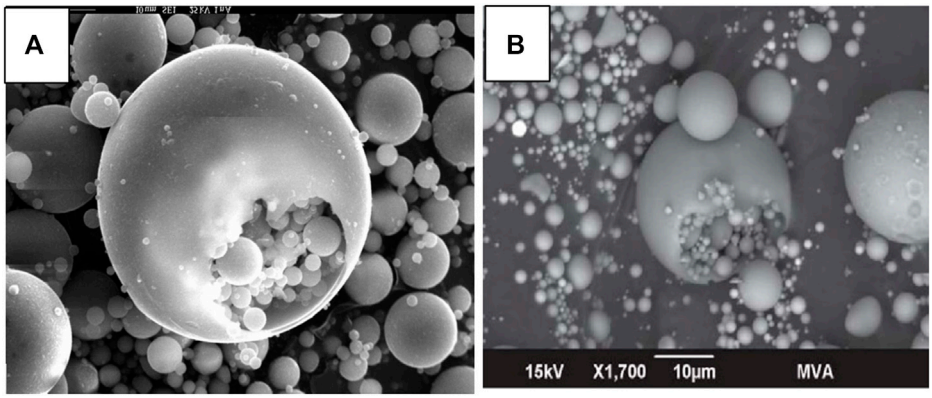

FIGURE 4
(A) SEM micrograph of glassy PS in CFA. Adapted from Kaasik et al. (2005). **(B)** Backscattered SEM image of PS. Adapted from Chepaitis et al. (2011).

In addition to this, there are several reports where CS were used either directly or surface functionalized with other metallic particles like Ni, Zr, etc., for enhanced applications. CS have been used for the direct remediation of dyes and other effluents from wastewater at a much more economical cost (Markandeya et al., 2021). In addition to this, surface-functionalized CS are also used in defense applications, nanocomposites, and high mechanical strength material. CS were also used in construction materials, as a lightweight material, an insulating material, in ceramics, as fillers, as a composite material, and as an internal curing agent (Birla et al., 2017; Yadav et al., 2021b). Vereshchagina et al. (2018) synthesized analcime zeolite from CFA CS, and furthermore, they developed a Zr-analcime nanocomposite from CFA CS (Vereshchagina et al., 2018). Khoshnoud and Abu-Zahra (2015) observed the effect of CS CFA on the thermal, mechanical, and morphology of rigid polyvinyl chloride (PVC) composites (Khoshnoud and Abu-Zahra, 2015). Figure 2 shows an XRD pattern of CS from lignite CFA from Thailand TPPs, which clearly shows minerals like anhydrite, C—calcite, CS—calcium silicate, E—ettringite, L—lime, M—magnetite, Me—merwinite, Mu—mullite, P—potassium magnesium silicate, Po—portlandite, Q—quartz, and Sr—srebrodolskite (Yoriya and Tepsri 2021).

3 Basic properties of plerospheres and ferrospheres

3.1 Plerospheres

Morphologically, PS are similar to CS and co-exist in CFA in mainly two types, i.e., thick-walled and thin-walled. PS could also be categorized into primary plerospheres and secondary plerospheres (based on internal particles and composition). Primary plerospheres contain smaller spherical particles within them, making them denser (Fisher et al., 1978; Goodarzi and Singh, 2001; Sunjidmaa et al., 2019). As per the literature, the ruptured PS contain Fe, which is produced from the dissociation of

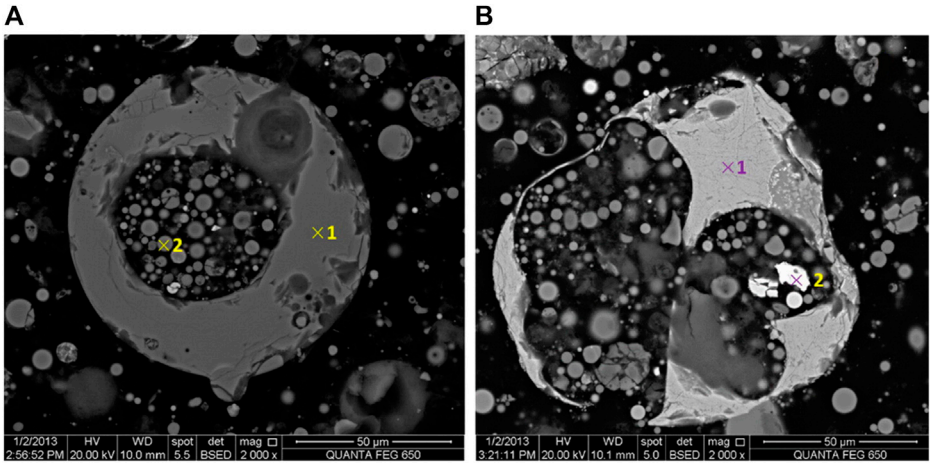

FIGURE 5
(A) Typical SEM image of a plerosphere. **(B)** SEM image of a cracked PS filled with metallic Fe. Adapted from Liu et al. (2016).

TABLE 1 Chemical composition of CS classified according to their sizes. Adapted from Yoriya and Tepsri (2021).

Item	Composition (wt. %)							
	SiO_2	Al_2O_3	Fe_2O_3	CaO	SO_3	K_2O	TiO_2	MnO
Cenospheres								
Bulk	47.23 ± 0.56	22.92 ± 0.14	9.71 ± 0.48	10.89 ± 0.27	3.98 ± 0.12	4.54 ± 0.15	0.80 ± 0.02	0.06 ± 0.00
<45 µ	41.31 ± 0.16	19.61 ± 0.21	12.62 ± 0.15	15.50 ± 0.13	6.47 ± 0.10	3.76 ± 0.02	0.63 ± 0.00	0.11 ± 0.005
45–105 µ	53.39 ± 0.17	25.02 ± 0.06	7.84 ± 0.06	6.36 ± 0.11	1.88 ± 0.11	4.72 ± 0.07	0.78 ± 0.02	0.06 ± 0.001
106–250 µ	51.92 ± 0.23	23.72 ± 0.13	9.70 ± 0.11	8.28 ± 0.21	1.99 ± 0.04	3.57 ± 0.04	0.77 ± 0.005	0.06 ± 0.003
>250 µ	49.71 ± 0.93	20.80 ± 0.59	11.62 ± 0.99	11.56 ± 0.29	2.28 ± 0.31	3.23 ± 0.15	0.72 ± 0.02	0.08 ± 0.001

Fe^{2+} or Fe^{3+} in a strongly reducing environment before the rupture of PS (Adesina, 2020). Plerospheres are basically spheres within spheres, where smaller spherical particles become trapped inside larger spherical particles along with numerous minerals and gases. As a result, such plerospheres may be hollow and light in comparison to ferrospheres (Goodarzi and Sanei, 2009). These PS are mainly thin-walled compared to FS. The sizes of PS vary from a few microns (µ) to more than 20 µ; however, their average size is mainly <10 µ (Liu et al., 2016). Plerospheres (Goodarzi and Sanei, 2009) (or spheres within spheres) are essentially spherical-shaped, hollow, and mostly thin-walled CFA particles that have encapsulated a number of sub-microspheres or mineral particles (Goodarzi and Sanei, 2009) of different sizes (mainly <10 µ) (Liu et al., 2016). Most of their features, such as chemical and elemental composition, morphology, etc., are similar to cenospheres. However, the two vary in their morphology as cenospheres are hollow in nature, while plerospheres are solid in nature (Choudhary et al., 2020). It has been found that in some CFA samples, CS were larger, while in others, PS were larger. However, normally, PS should be larger due to the presence of filled gases and minerals. The size of PS varies from 0.2 to 8 µ, while the size of CS is 10–1,000 µ based on the TPPs, combustion temperature, and types of coal used (Yoriya et al., 2019; Yoriya and Tepsri, 2020). Ruptured PS release numerous smaller microspheres and mineral particles (Strzałkowska, 2021), as shown in Figures 3A, B, 4A, B, 5A, B where scanning electron microscope (SEM) images show ruptured PS with numerous small spherical particles present within them. To date, very little information is available on PS in the scientific community.

Structurally, PS is either thick- or thin-walled. Based on their origin and formation, they could be of two types, primary plerospheres and secondary plerospheres (Goodarzi and Sanei, 2009). These structurally different types of PS form due to high-temperature (1,200–1,700°C) thermochemical transformation of the organic matter and mineral components in coal during combustion (Liu et al., 2016). PS form due to the differential melting of particles and the influence of gases generated by the: 1) dehydration of clay minerals and 2) decomposition of calcium carbonate and carbon present on the surface or inside the ash slag particles (Fisher et al., 1976). This type of method of PS formation is known as a primary process. PS with larger diameters (e.g., 100 µ) are very common in CFA, enclosing sub-microspheres or mineral fragments (mostly <10 µ) and reportedly have high mechanical strength and chemical reactivity (Snellings et al., 2021).

TABLE 2 Chemical composition of CFA PS. Adapted from Haustein and Kuryłowicz-Cudowska (2020) and Chepaitis et al. (2011).

Element	CFA plerosphere wt. %
Si	25.54
Al	10.93
Mg	0.99
Na	2.92
Fe	—
Ca	1.17
P	—
S	—
K	4.03
Ti	—
C	10.39
O	44.03

PS have generally spherical-shaped particles with several smaller particles and mineral fragments (Yoriya and Tepsri, 2020). Both thick- and thin-walled PS release secondary plerospheres or mineral particles after wall rupture. As the name suggests, thick-walled plerospheres have thick walls due to a coating of carbon and other minerals. Figure 5A shows a typical structure of PS under SEM, while Figure 5B shows PS with ferrous content (Liu et al., 2016). Very little research has been conducted in this area, and limited information is available in the scientific domain. Table 1 shows the chemical composition of fly ash CS, which indicates that CS are rich in Al and Si. From the chemical composition, one can easily conclude that both CS and PS contain mainly alumina and silica, along with other intermediate and trace elements such as Na, Mg, Ca, K, P, S, and Ti. The carbon composition could be higher or lower based on the type of coal used for the fuel in the TPPS, and other operating conditions of the furnaces of the TPPs. Yoriya and Tepsri (2020) reported that the chemical composition of CS depended on the size of the particles, even though their basic elements remained the same. The CS size and chemical composition were assessed in CS collected from lignite CFA from Thailand TPPs. Table 2 shows the chemical compositions of PS extracted from CFA. Table 3 shows the major differences and similarities between FS, CS, and PS extracted from CFA.

Figures 6A, B show the energy-dispersive spectroscopy (EDS) spectra and elemental composition of PS and CS, respectively. Figures 6A, B show the presence of common elements in both structures. The EDS shows that both structures vary only in the percentage of elements. The major elements are Al, Si, O, and Fe. Other elements are present in trace amounts in both structures.

3.2 Ferrosphere properties and types

FS are present in all CFAs, i.e., they are produced from lignite, bituminous, sub-bituminous, and anthracite. They are known as magnetic microspheres or spinels. A typical FESEM image of FS is shown in Figure 7, which reveals the presence of several spherules and angular deposits of iron oxides on their surfaces.

The major mineralogical composition of magnetic fractions of CFA are ferrospinels (79%–90% wt.%). The FS of CFA have all three phases of iron oxides, i.e., magnetite along with Ca, Mg, and Mn, with hematite comprising approximately 5–17 wt. %, maghemite gamma-Fe_2O_3, and a paramagnetic phase of approximately 2–8 wt% (Sokol et al., 2002; Sokolar and Vodova, 2011). FS are ferrous-rich spherical particles that can be rough or smooth based on the deposition of the ferrous fraction on the surface of aluminosilicate spheres (Yadav et al., 2021a). These can be of various shapes and sizes, depending on their surface texture, the type of coal used, the temperature of the furnace, etc. CFA-extracted FS morphology can be either rough or smooth, in which the rough spheres show depositions of ferrous particles on their surface and are comparatively more magnetic than the smooth-surfaced ones (Sokol et al., 2002; Sokolar and Vodova, 2011). The two most dominant types of FS in CFA are rough- and smooth-surfaced FS. These iron-rich microspheres are formed during the combustion of coal, followed by the melting and condensation of the liquid mixes in the TPPs. Rough-surfaced FS have several ferrous-rich granular depositions on their surface, whereas the smooth-surfaced ferrospheres have a homogenous spread of molten ferrous on the surface, which is responsible for the weakly magnetic nature of the particles (Fomenko et al., 2021). Vast works of literature have shown that, based on the various operating conditions and global area, the size of FS varies from 90 nm to 20 μ (Liu et al., 2016). Fine CFA contains smaller-sized particles, while bottom CFA contains larger-sized CFA particles along with FS.

Several investigators have isolated ferrous fractions from CFA from various parts of the globe. For instance, Yadav and Fulekar (2014) reported the extraction of ferrous fractions from CFA collected from TPPS in Gandhinagar, Gujarat, India (Yadav and Fulekar, 2014). Yadav 2019 reported the presence of smooth and rough-shaped ferrous fractions in the CFA of the same TPPs. In both reports, the investigators observed FS sizes varying from 100 nm to several microns. The iron oxides on their surface were mainly present in mixed phases, i.e., magnetite, hematite, and maghemite, as revealed by x-ray diffraction (XRD). Moreover, Yadav et al. (2022a) extracted FS from CFA collected from TPPs in Kota, Rajasthan. The investigators extracted the FS from the CFA slurry using a strong magnet. Most of the FS were rough-surfaced, with angular and spherule deposits on their surface. The size of the extracted FS varied from 400 to 700 nm (Yadav et al., 2022b).

Sharonova et al. (2015) reported the extraction of approximately eight fractions of FS from high calcium-containing CFA collected from a Russian TPP. The size of the extracted FS varied from 0.4 to 0.02 mm (Sharonova et al., 2015). Valentim et al. (2016) extracted FS from CFA collected from TPPs in Bokaro and Jharia. The investigators reported that the coal used to feed the TPPs mainly contained ferrous carbonates like siderite. Whereas in the CFA, the iron oxide content was about 2.7 wt.% to 4.5 wt.%. The investigators also confirmed the presence of magnetite and hematite phases of iron oxides in minor ratios in the CFA (Valentim et al., 2016). Fomenko et al. (2021) extracted ferrous fractions and categorized them according to size, i.e., particulate matter (PM2.5, PM2.5–10, and PM10) (Fomenko et al., 2021). Sokol et al. (1998) extracted FS

TABLE 3 Basic differences and similarities between FS, PS, and CS extracted from CFA.

Property/ feature	Ferrospheres	Plerospheres	Cenospheres	Reference
Shape and types	Spherical, ellipsoidal, molten drop, etc.	Spherical, and thick- and thin-walled	Spherical	
Size (μ)	1–500 μ	0.2–8 μ	10–1000 μ	Żyrkowski et al. (2016), Yoriya and Tepsri (2021)
			20–300 μ	
Definition/ meaning	—	Plerosphere from Greek: plërës + sphere = filled sphere	Cenosphere is derived from Greek: kenos + sphere = hollow sphere	
Shell thickness (μ)	—	—	2–30 μ	
External texture	Rough to smooth	Smooth, some with an opening at one end	Smooth	
Internal structure	Solid	Solid	Hollow	Zierold and Odoh (2020)
		Partially filled with porous magnetite-hematite aggregates	Can have very thin (tenuisphere) or thick walls (crassisphere)	
Voids filled with	—	Small irregular aluminosilicate grains, unburnt (fusained) coal particles, foam, and spongy and porous framework	Irregular aluminosilicate grains (mainly mullite), iron oxides, unburnt (fusained) coal particles, and spongy (porous) form	
Magnetic nature	Highly magnetic	Non-magnetic to weakly magnetic	May be weakly magnetic	Yoriya and Tepsri (2021)
Percentage in CFA wt. %	5%–15%	0.1–3.8 wt.%	0.3%–1.5%	Fomenko et al. (2011)
Density	2.4 higher density than PS and CS	Higher than CS	Low density for lighter CS: 0.2–2.6 g/cc	Żyrkowski et al. (2016)
		0.75–9.0 wt.%	For heavy metal and Al-bearing CS-02.9 g/cc	
		Due to its high density, more easily captured by an electrostatic precipitator	Average density <1 g/cm^3	
Mechanical strength	High	High	Very high	Żyrkowski et al. (2016)
Porosity	Lowest	Highly porous	Less porous	
		Due to high porosity, most PS sink in water with CFA		
Specific gravity	—	Higher	Lowest	Yoon and Park (2017)
Crystalline phases	Magnetite, hematite, quartz, calcite, etc.		Quartz, mullite, calcite	Żyrkowski et al. (2016)
			Higher alumina and higher mechanical strength	
Chemical composition	Fe, O, and traces of Al, Si, Ca, Na, C, etc.	Dominated by Si, Al, C, O, and traces of Fe, Ca, Na, etc.	Dominated by Si, Al, C, O, and traces of Fe, Ca, Na, etc.	Fisher et al. (1976)
Separation method	Magnetic and density-based, and easy to separate	Non-magnetic and density-based	Non-magnetic and density-based	Fomenko et al. (2021)
Applications	Ceramics, petroleum cracking, adsorbents, research, and medicine	Ceramics	Ceramics, defense, and nanocomposites	Liu et al. (2014)
				Guedes and Valentim (2021)
				Kanhar et al. (2020)

from the Russian Chelyabinsk basin and reported the presence of magnetic particles of variable geometrical shape; i.e., triangular, rectangular, spherule, and polygonal on the external surface of the FS. They also reported the presence of dense dendritic FS about 50–120 μ in size, which comprised about 85% wt. fraction of the total ferrospinels. Furthermore, investigators also reported the presence of magnetic particles on FS in a "pine-tree" pattern and ferrite FS with dimensions in the range of 100–200 nm with lower [illegible] occurrence and comparatively larger than other FS. Finally, the investigators found magnesioferrite in the CFA, which had high reflectivity and formed octahedra 10 μ in size in the microsphere core, whose spaces were filled with calcium ferrite (Ohman et al., 2002).

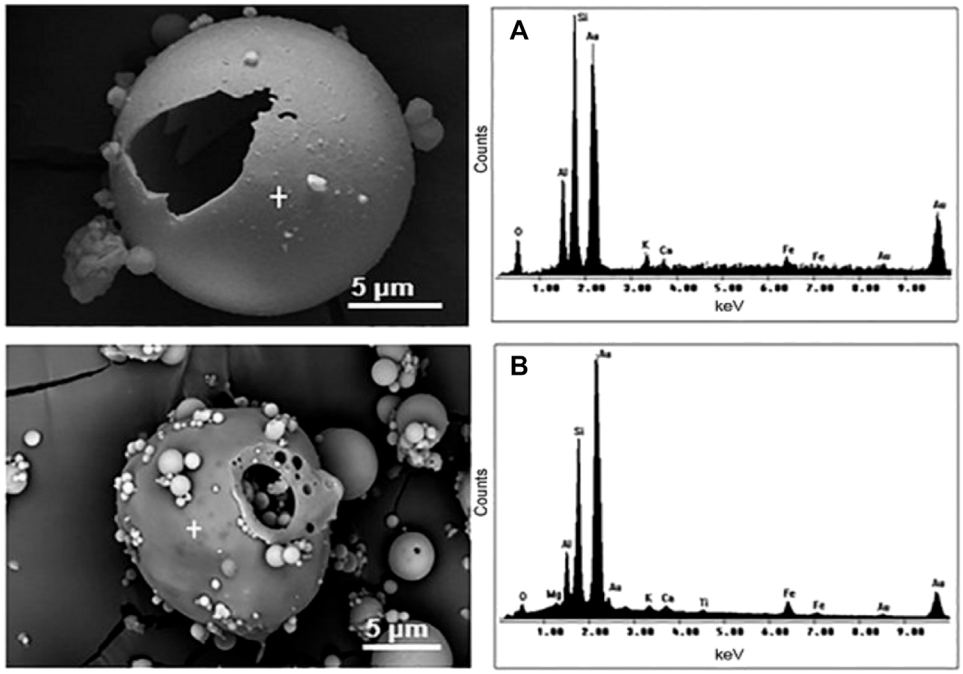

FIGURE 6
SEM micrographs and EDS spectra of CS **(A)** and PS **(B).** Adapted from Ferrarini et al. (2016).

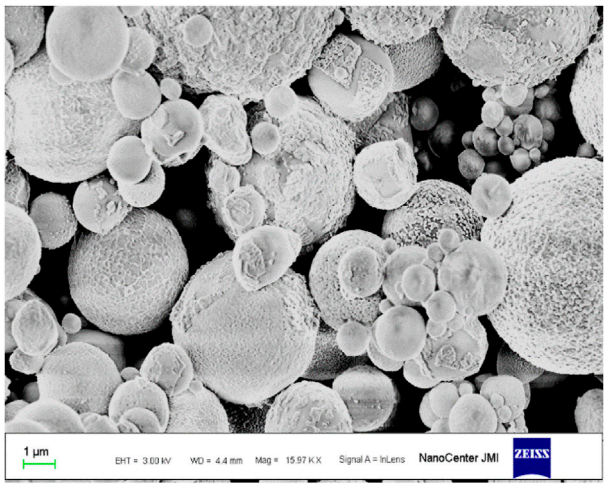

FIGURE 7
FESEM micrographs of CFA ferrospheres. Adapted from Yadav et al. (2020a).

Rough-surfaced ferrospheres have depositions of ferrous particles on their surfaces and are comparatively more magnetic than the smooth-surfaced ferrospheres (Sokol et al., 2002; Um and Jeon, 2021). Rough-surfaced ferrospheres have several ferrous-rich granular depositions on their surface, while smooth-surfaced ferrospheres have a homogenous spread of molten ferrous on their surfaces, which is responsible for their weakly magnetic nature (Fomenko et al., 2021). It is evident from the literature that the iron oxides in the ferrospheres of CFA are present in all three phases; i.e., magnetite, maghemite, and hematite on the surface of ferrospheres, mainly in the magnetite (Fe_3O_4) and hematite (α-Fe_2O_3) phases. Several investigators have confirmed the presence of hematite and magnetite (Xue and Lu, 2008; Valentim et al., 2016; Anshits et al., 2018; Yadav et al., 2022b) in CFA collected from different parts of the globe.

All these ferrous granules are deposited on the spheres where the ferrous particles are deposited in the form of dendrites. The ferrous particles/granules are deposited on the ferrospheres during the vaporization and condensation of CFA particles (Sokol et al., 2002). From the literature, it is also well-proven that the source of such ferrous particles is coal, which contains pyrite minerals. At high temperatures in the furnaces of TPPs, these pyrite minerals undergo oxidation and reduction and are transformed into iron oxides. From the literature, the ferrous content of CFA mainly varies from 5% to 15%. This range could vary marginally, based on the area of the globe. Numerous investigators have tried to isolate the ferrous fractions from the CFA, either by dry magnetic or wet slurry-based magnetic separation techniques. The dry magnetic separation technique involves the use of conveyor belts with magnetic fittings at one side to collect the magnetic fractions of the CFA. The slurry-based wet magnetic separation method involves the use of liquid for mixing the CFA. This is followed by a collection of magnetic fractions using a strong magnetic or applied magnetic field (Xue and Lu, 2008).

Regarding the elemental composition, CFA mainly comprises Si, Al, Ca, Fe, and O and traces of Na, K, P, Ti, etc. Ferrospheres are rich in Fe and mainly present with Al, Si, Ca, Ti, and O. The matrix is made up of Al and Si, while the surface contains ferrous. The

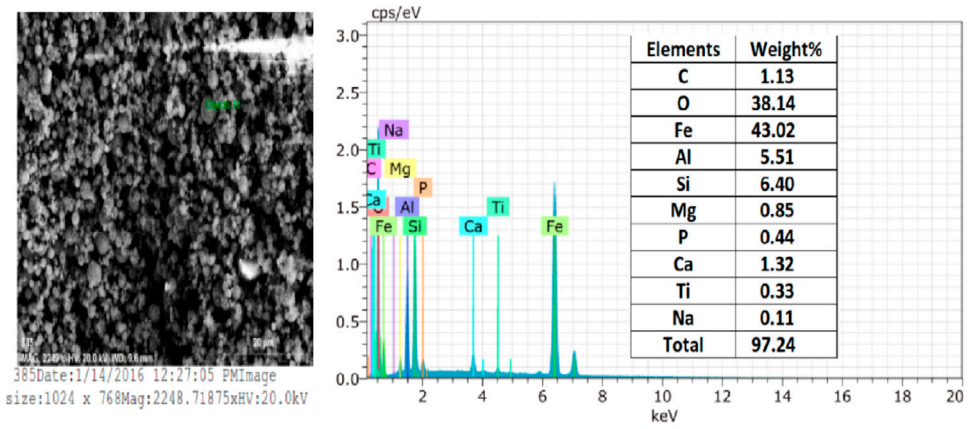

FIGURE 8
EDS spot, EDS spectra, and elemental composition of ferrospheres. Adapted from Yadav et al. (2022b).

composition of such ferrospheres may slightly vary due to the source of coal used in the TPPs, which may be a rich source of other minerals depending on the mines. EDS analysis in the literature revealed appreciable amounts of Si, S, Al, and Ca in ferrospheres, which may come from quartz, mullite (Yadav et al., 2020b), anhydrite, and amorphous materials in the CFA. Therefore, the major elemental compositions of ferrospheres are Fe and O along with Ca, Mg, Na, K, Ti, and C. The presence of Al, Si, C, Ti, Ca, Mg, etc., along with Fe in extracted FS has been reported by several investigators (Xue and Lu 2008; Valentim et al., 2016; Sokol et al., Anshits et al., 2018; Yadav et al., 2022b) in CFA collected from different parts of the world. Yadav et al. (2022a) reported the presence of approximately nine elements in their oxides in CFA collected from the Kota TPPs by EDS analysis, as shown in Figure 8. Here, Fe was present in the highest percentage (43.02%) followed by elemental Si (6.4%) and Al (5.51%). O was present at about 38.14%. The CFA also contained traces of Na, Ti, Ca, P, Mg, and C.

Extracted FS have several elemental impurities in the form of Al, Si, Ca, C, etc. so are widely used in the petroleum industries as a catalyst, as well as cokes in the steel industry, etc. However, hardly any literature is available in which these CFA ferrospheres have been used in highly pure form in research or industries. Attempts have made to utilize these ferrous fractions from CFA as a source of raw material for the synthesis of iron particles. In one recent attempt, Yadav (2019) synthesized highly pure iron oxide nanoparticles from CFA by treating the extracted FS with strong mineral acids. Here, the extracted FS was treated with strong acids to obtain ferrous leachate, which in turn was used as a precursor material for the synthesis of IONPs by chemical coprecipitation (Yadav, 2019).

3.3 Types of ferrospheres

Structurally, FS extracted from CFA have different shapes and sizes. Several investigators have revealed the surface texture of ferrospheres by scanning electron microscopy (SEM) (Sokolar and Vodova, 2011). The FS in fly ashes can be divided into several types, namely, rough, smooth, polygon, dendritic, granular, and molten drop ferrospheres (Zhao et al., 2006).

Most FS have rough surfaces, with shapes close to an ideal sphere. Sokol et al. (2002) reported that most of the extracted FS from a Russian TPP were close to ideal spheres, with dendritic or skeletal morphology (Sokol et al., 2002). Rough-surfaced FS have depositions of numerous ferrous particles on their surface, which are crystalline in nature and have mixtures of magnetite, maghemite, and hematite. The size of these deposited ferrous particles varies from 50 to 200 nm. These deposited ferrous particles provide magnetic properties. Such types of ferrospheres are called rough-surfaced FS. In comparison to smooth-surfaced FS, rough-surfaced FS have higher magnetic strength.

Granular ferrospheres have a rough, porous, and granular surface structure and are often complicated by the additional presence of small granular crystals. The granular crystals on the surface of the ferrospheres are predominantly a result of iron oxide crystallization when the temperature decreases in the furnace of TPPs. Yadav et al. (2022a) reported the extraction of rough-surfaced FS with angular and granular deposits on their surface in CFA collected from TPPs in Kota, the SEM images of which are shown in Figure 9.

Another type of ferrosphere is the smooth-surfaced type, with uniform depositions/distribution of ferrous on their surfaces. Due to this uniform distribution of ferrous, they have lower magnetic strength or are weakly magnetized. The diameter of smooth ferrospheres often varies from 40 to 60 μ. EDS and other instrumental analyses have shown low Fe content in smooth-surfaced ferrospheres. Figure 10A shows FESEM images of mixed, i.e., both smooth and rough-surfaced, FS. Figure 10B shows smooth-surfaced FS from Yadav et al. (2022b).

Polygon ferrospheres often exhibit blocky surface crystallites of iron oxides. Molten drop FS, with a great deal of goblet and granular particles on their surfaces, are formed during crystallization of iron oxides from the liquid melt of the inner particles (Fonseka et al., 2021). A team led by Vu reported SEM images of magnetic and non-magnetic fractions of ferrospheres from CFA collected from

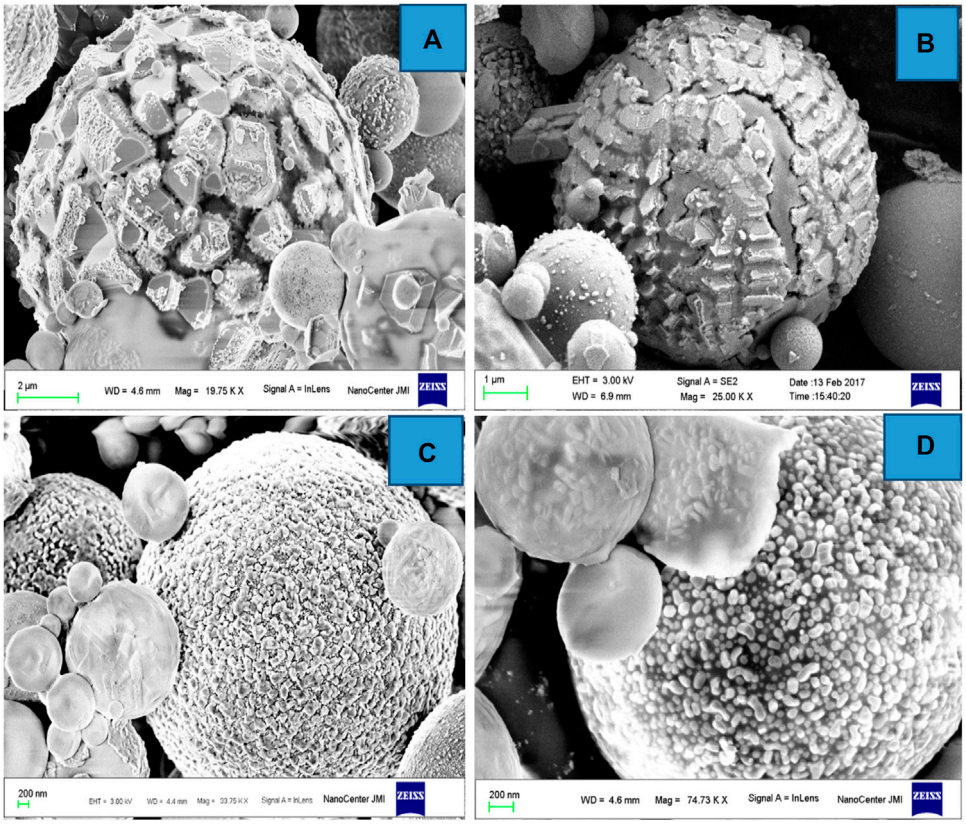

FIGURE 9
FESEM micrographs of ferrospheres. **(A)** Angular deposits. **(B)** Crystalline pattern. **(C)** Spherule deposits. **(D)** Minute spherule deposits. Adapted from Yadav et al. (2022b).

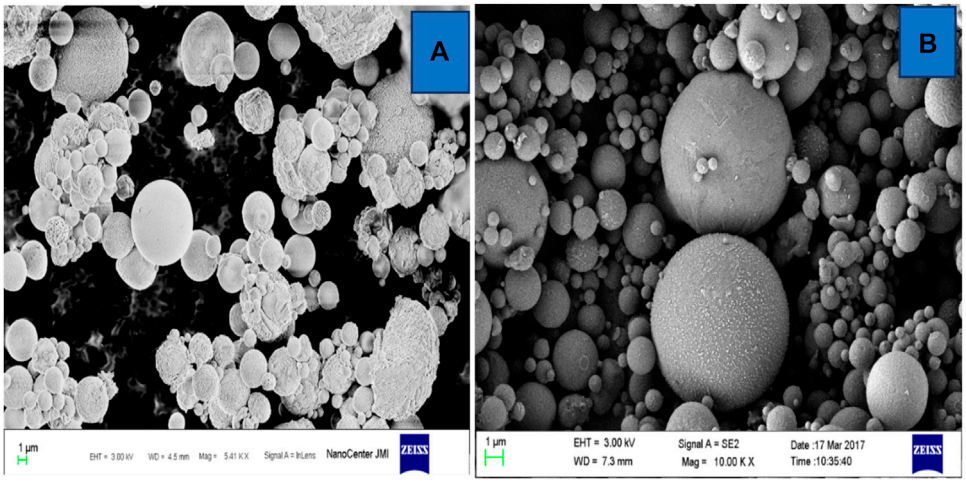

FIGURE 10
FESEM micrographs of fly ash rough and smooth ferrospheres **(A,B).** Adapted from Yadav et al. (2022b).

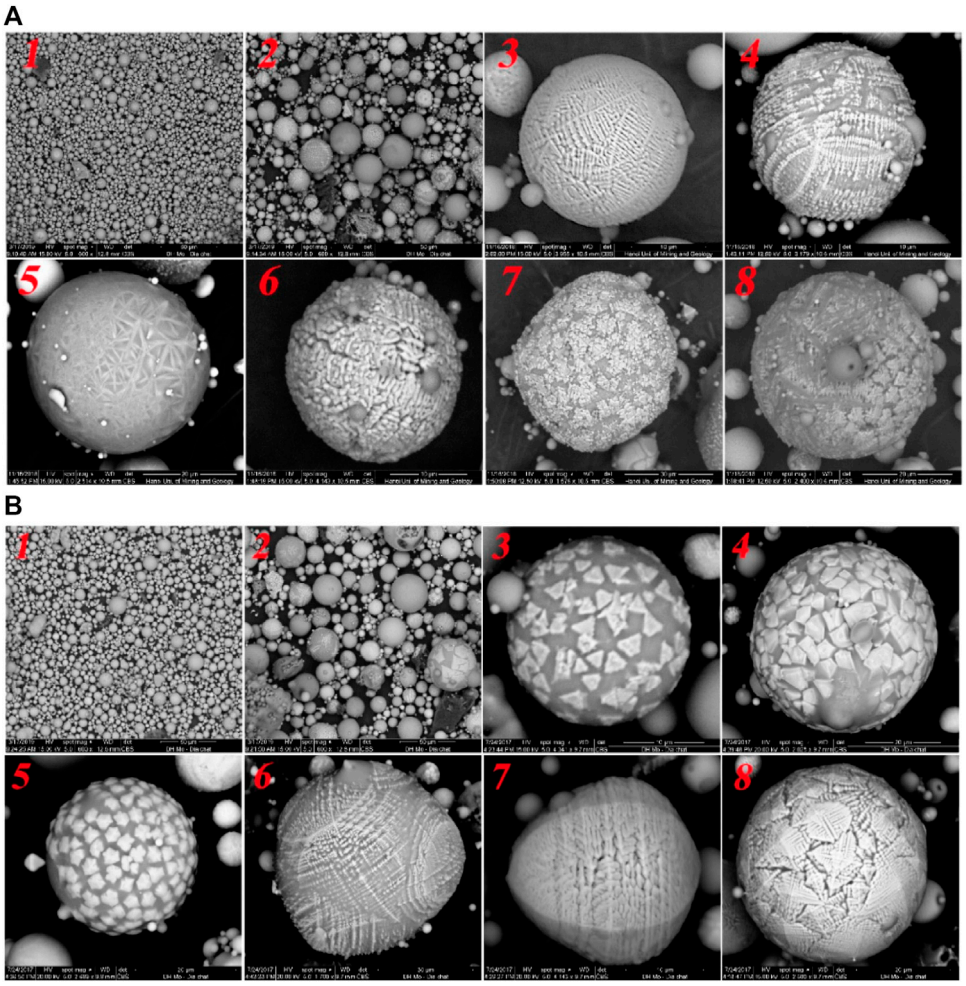

FIGURE 11
SEM micrographs of nonmagnetic 1 and magnetic particles (2–8) **(A,B)** collected from Uong Bi and Pha Lai fly ash. Adapted from Vu et al. (2019).

two different TPPs in Vietnam, as shown in Figure 11 (Vu et al., 2019).

4 Mechanisms of ferrosphere and plerosphere formation in CFA

In addition to ferrospheres, CFA ferrous fractions also have plerospheres, which are hollow encapsulated spherical CFA particles filled with minerals and gases. CFA also contains cenospheres, which are spherical-shaped Al- and Si-rich particles with sizes varying from 5 to 50 μ (Yadav et al., 2020a).

4.1 Mechanism of plerosphere formation in CFA

Generally, CFA has both cenospheres and plerospheres; in such CFA, only a small portion of the cenospheres may be transformed into secondary plerospheres. CS can be transformed into PS by one of the following mechanisms, as shown in Figure 12. During the combustion of coal, various minerals in the coal decompose, including carbon, carbonates, or carbides. As a result, the CFA particles will expand to stable CS. Due to this, the internal pressure of the CS will increase, followed by the formation of an aperture in the over-expanded CS, which releases the gas once its wall is punctured. Investigators have reported that puncture of the wall is possible due to collisions, which generate apertures of various sizes (Goodarzi and Sanei, 2009). During this step, CS that are ruptured are impregnated with microspheres that are confined within the cenosphere wall to form a secondary plerosphere. Which forces are behind the entry of CS into the MS is not clear. The finer particles may be trapped by the PS, which may be retained in the control devices of the TPPs; hence, such particles will be released into the air atmosphere at low concentrations. If PS and hollow CS have almost the same dimensions, the PS are heavier due to the additional weight of captured microspheres (Goodarzi and Sanei, 2009). Figure 12 shows the probable mechanism for the formation of plerospheres in CFA, as adapted from Chepaitis et al. (2011) and Goodarzi and Sanei (2009), respectively. According to Chepaitis et al. (2011), PS formation successively takes from a cenosphere; for instance, a CS particle in which the surface is weakened due to various

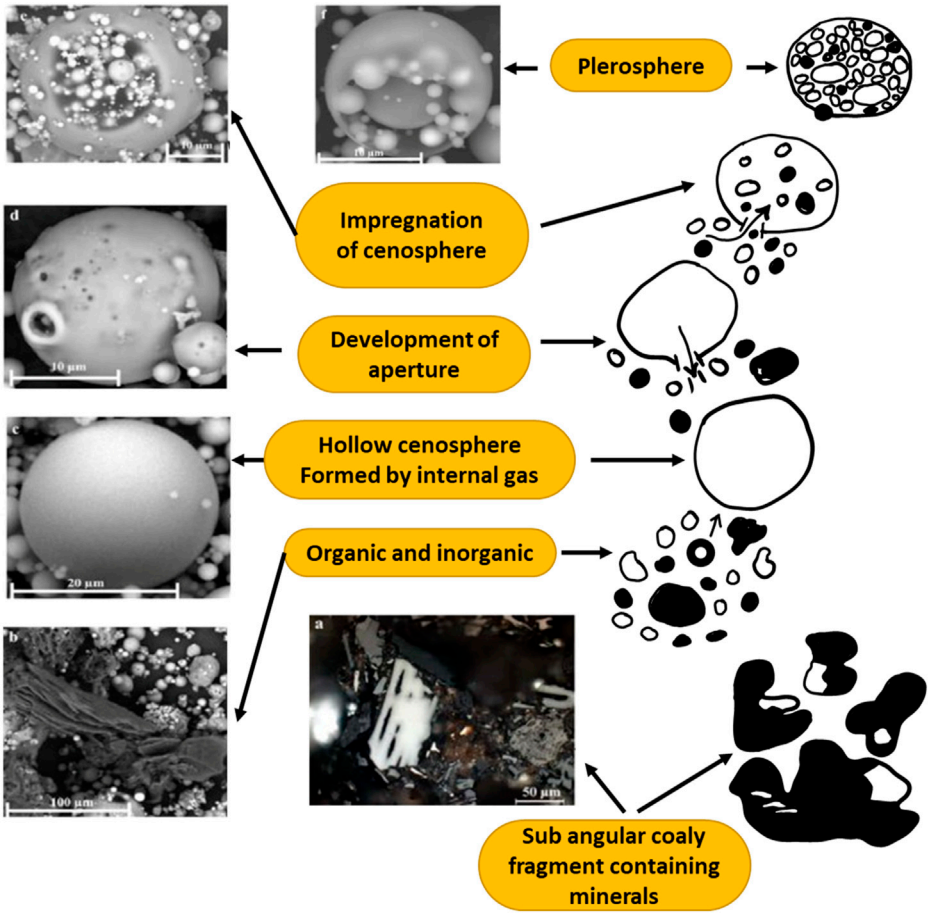

FIGURE 12
Mechanism of plerosphere formation. **(A)** Feed coal. **(B–F)** Electro precipitator (ESP) fly ash. SEM carbon-coated surface. Adapted from Goodarzi and Sanei (2009).

internal and external factors. The ruptured spherical particle from the previous step is filled with numerous smaller spherical particles, mineral fragments, and gases from the surroundings. This mechanism is common for the formation of both thick and thin-walled PS from CFA. Goodarzi and Sanei also reported a detailed mechanism for the formation of plerospheres in CFA (Goodarzi and Sanei, 2009).

5 Formation of ferrospheres in CFA

Coal contains pyrite and other sources of iron, which are used for the production of electricity in TPPs (Waanders et al., 2003). The high temperature of the furnace melts these organic and inorganic ferrous contents and forms a molten slag. This molten slag undergoes condensation and acquires a spherical shape while descending in the furnace (Guzmán-Carrillo et al., 2018). The preformed matrix has mainly Al and Si along with carbon, while iron is deposited on the surface of the preformed spheres. The deposition of granular iron on the surface of preformed spheres leads to rough-surfaced ferrospheres. This type of magnetic sphere is strongly magnetic. The other type of ferrosphere is the smooth type, in which the ferrous and nonferrous melt, attaining a spherical shape. In this type of sphere, the ferrous particles are evenly distributed in the spheres; however, the spheres are weakly magnetized (Sunjidmaa et al., 2019).

Sokol et al. (2002) described the mechanism of formation of FS in TPPs in Russian Chelyabinsk. The authors suggested that during the combustion of fuel, high ferrous melts arise from the melting of the ferrous carbonates of coal. The confirmation of this supposition was strengthened by the increased content of P and Mn in the siderite and ankerite and FS. The chemical composition of each melt or final FS is determined by the chemical composition of Fe carbonate having admixtures of pelitic material. If the heating temperature is >1,000°C, a considerable amount of Na and small amounts of K and Si are volatilized. Therefore, drops of ferrous melts have reduced amounts of Na, Si, and K and are enriched for Fe compared to the initial material (Sokol et al., 2002).

These iron melts have iron in the form of Fe^0, Fe^{2+}, and ferrite complexes $(Fe^{3+}\ O_2)^-$ and $(Fe^{3+}O_5)^{4-}$. The Fe-bearing phases are formed extremely reducing conditions as a proper phase in silicate liquid. When the furnace temperature is > 1,200°C, there will be minimal fugacity of O_2. The major fraction of FS is ferrispinels and silicate glass instead of native Fe or ferrosilicon. Hence, the formation of

such FS proceeds under conditions of higher partial oxygen pressure. Furthermore, the minerals of Fe are mainly governed by the temperature of the furnace in TPPs. Moreover, temperature also plays a role in the amorphous and crystalline nature of the minerals associated with FS. Silicate liquids with ferrous iron appear during the melting of CFA material at 1,000–1,100°C. During CFA formation, ferrite liquid with surplus amounts of Fe^{3+} in the form of $(FeO_2)^-$ and $(Fe_2O_5)^{4-}$ anions mainly appear at temperatures >1,500°C (Strzałkowska, 2021).

Furthermore, the nature and phases of iron oxides in FS depend on the cooling history of ferrous melts. The stability of minerals depends on the temperature in FS. Moreover, the Fe oxidation state in the FS depends on oxygen concentration and temperature. In addition to these two, it also depends on several other factors inside the furnace. The crystallization of ferrispinels is also governed by the temperature, i.e., lower temperatures favor crystallization. The chemical composition of ferrispinels is determined by the bulk chemistry of the melt (Ca, Mg, Mn, and Si concentrations), temperature, quenching rate, and O_2 fugacity. The crystallization of iron oxides leads to the enrichment of Ca, Mg, Si, and Al in the melt (Sokol et al., 2002). Ngu et al. (2007) reported the numerical ratio between PS and CS in CFA collected from an Australian TPP. The investigators demonstrated that this ratio increased with increased typical diameter (D_0). Choo et al. (2020) also reported the effect of temperature on the shape, size, phase transformations, and thermal expansion of cenospheres in CFA collected from a Malaysian TPP.

6 Extraction of ferrous particles and plerospheres from CFA

6.1 Recovery of plerospheres

Although CFA contains structurally varied types of particles, the two most closely related are CS and PS. Since PS have numerous smaller microspheres inside them, they are considerably heavier than the hollow CS (Danish and Mosaberpanah, 2020). Thus, CS and PS could be easily separated by means of density gradation. One such economical, and the most common, method is centrifugation, in which the heavier particles (PS) settle earlier and the hollow (lighter) CS settle later. Therefore, CS can be collected by decanting the supernatant, while PS can be collected from the residue. The residual particles can be washed several times with water to obtain pure PS free from CS and FS. PS can also be collected using a cyclone, which applies centrifugal force.

Since PS of same dimension as that of CS will be heavier due to the captured particles, it can be separated from the CFA slurry mixture by the centrifugal force generated in the cyclone. This is easier and more efficient if FS are first recovered using a magnet and then from nonferrous residue using cyclone. Hence, the heavier PS will be removed from the stream, while the lighter CS will remain in the stream of the cyclone. This is one way of enriching PS from a CFA sample, as reported by Goodarzi and Sanei (2009), who also reported the role of PS in reducing finer particles from TPPs.

Sharonova et al. (2003) reported the potential presence of PS in the magnetic microspheres in CFA. They further stated that it is very difficult to quantify the fractions of PS in close-cut fractions as the outer wall can be continuous and, in this case, would screen the inner part of a globule. They found about 16% PS in the magnetic microspheres of CFA of Ekibastuz coal, with an Fe_2O_3 content of approximately 48%.

6.2 Extraction of ferrospheres from CFA

CFA ferrous fractions can be extracted by both wet slurry and dry magnetic separation methods. The dry separation method involves the formation of a slurry with water and extraction with the help of a strong magnet (Wrona et al., 2020). The dry separation involves the water-free based extraction of the ferrous fraction by conveyer belts. At one end of the conveyer belts, a strong magnet is attached to separate the magnetic fractions get from the nonmagnetic fractions (Valeev et al., 2019). Several investigators have reported the recovery of ferrous fraction from CFA by both dry and wet slurry separation processes (Petrus et al., 2011). The extraction of ferrous particles is possible by magnetic separation methods, which will also segregate ferrous from non-ferrous components.

The extracted ferrous particles can be further purified by treatment with various acids to synthesize pure iron oxides. Fomenko et al. (2021) reported the presence of magnetic fractions in CFA from Ekibastuz, with particulate matter sizes of about 2.5, 2.5–10, and 10 μ (Fomenko et al., 2021). Han et al. (2009) reported the recovery of magnetic fractions of CFA by wet slurry magnetic separation methods in coal bottom CFA. Yadav and Fulekar (2019) reported the extraction of ferrous fractions from CFA produced by TFFs in Gandhinagar by the wet slurry separation method. These were further transformed into four different phases of iron oxides by chemical and physical approaches. The size of the ferrospheres extracted from CFA was 0.2–7 μ, as revealed by FESEM and TEM (Yadav et al., 2023a; Yadav et al., 2023b). Sharonova et al. (2003) and Fomenko et al. (2002) also initially characterized FS in CFA and later extracted FS by applying dry and wet magnetic separation methods with varying efficiency from CFA of TPPs.

7 Applications of ferrospheres and plerospheres

7.1 Applications of ferrospheres

Ferrospheres extracted from CFA are chemically diverse due to the presence of Fe, Si, Al, C, K, Ca, Mg, etc., and are suitable for various applications, especially as catalysts in the petroleum industry, mainly in the high-temperature process of based oxidative dimerization of methane (Alterary and Marei, 2021; Naeem et al., 2022). FS are used frequently used in metallurgy for the extraction of pure iron particles. In metallurgy, FS are also used in steel industries for coke-smelting, and ore and coal dressing. Some examples in the literature have demonstrated the use of FS recovered from CFA as fillers for composite materials, which have gained significant attention (Zhao et al., 2006). FS are used as an alternative source of ferrous materials due to their high ferrous content (Dindi et al., 2019). FS are used as a raw material for iron-based industries. FS have also been widely used for the preparation

of nanocomposites for various applications, as reported by Yadav et al. (2021a). They are also used in concrete and ceramics applications like dense concrete production and nanoceramics (Nakonieczny et al., 2020).

Several investigators have used CFA ferrospheres as an adsorbent for the removal of dyes and other inorganic pollutants from wastewater. Fomenko (1998) demonstrated the application of FS extracted from TPPs as a catalyst for the high-temperature oxidative conversion of CH_4 (Anshits et al., 2021).

Moreover, recently they have been used in metallurgical processes; for instance, for the recovery and synthesis of iron oxide particles. Yadav (2019) reported the synthesis of four different iron oxide particles (IOPs); i.e., magnetite, maghemite, hematite, and ferrous carbonate by using CFA ferrospheres. Here, the ferrospheres were used as a raw material or source of iron, which was treated with concentrated mineral acids along with sonication at optimized temperatures. The ferrous leachate was used as a precursor material for the synthesis of IOPs by chemical co-precipitation using NaOH as a precipitating agent. Initially, ferrous carbonate was synthesized, which was later transformed into other phases of IOPs by chemical and calcination at 500–700°C (Yadav and Fulekar, 2020).

More recently, Yadav et al. (2022a) extracted ferrospheres from CFA collected from an Indian TPP. The collected FS were then treated with strong mineral acids (sulfuric acid and HCl) under sonication for 90 min along with heating at 60°C. Finally, the investigators developed surface-modified FS as a result of etching by acids. These surface-modified FS were used to remove Azure A dye from aqueous solutions. Approximately 25.03% of the dye was removed within 30 min (Yadav et al., 2022a).

7.2 Applications of plerospheres

7.2.1 Reduction of pollution in the atmosphere

Plerospheres are used in civil engineering applications and road construction, in ceramics and glass industries, and as a cementing material. The literature has shown that PS could be used for the remediation of pollutants from wastewater. Another underestimated application of PS is that they trap ultrafine particles from TPPs, making them part of the bottom ash and preventing their release into the atmosphere to cause air pollution (Wang et al., 2004). Plerospheres play an important role in reducing the production of fine CFA particles from coal-based power plants. Fine particulate matter (<2.5 μ) emitted from coal-based power plants are hazardous to environmental and human health. These fine particles may cause cardiovascular and respiratory disorders (Schraufnagel, 2020). Air filters fail to capture these particles; thus, they disperse into the environment and remain suspended for a longer duration, depending on their density in the air. Such particles can travel longer distances and, thus, have a larger spatial impact. Therefore, it is of utmost priority to reduce the emission of such particles during combustion. Goodarzi and Sanei suggested that the formation of large plerosphere particles is one possible solution to capture smaller CFA particles. During combustion, plerospheres encapsulate finer particles and are later captured by particle control devices such as ESP or fabric filters (Goodarzi and Sanei, 2009; Schraufnagel, 2020).

7.2.2 Plerospheres in aerospace applications

Due to the unique properties of PS, they are commonly used to prepare composites used in aerospace applications due to their light weight and high mechanical strength. Nowadays, ultrafine PS are used to fill the phenolic matrix to produce an AO-resistant fiber/phenolic resin composite. Such PS do not react with atomic oxygen. Investigations have shown that the use of PS as fillers provides considerable protection to the fiber/phenolic resin against AO erosion (Wang et al., 2004; Qian and Xuan, 2018).

7.2.3 Plerospheres for the removal of air pollutants

CFA associated with different chemical constituents is used to efficiently resolve environmental problems such as air pollution. CFA contents could be used as an economical sorbent for flue gas purification and air cleaning. The primary components of CFA, such as silica, alumina, and oxides of Fe, have been employed for the removal of trace elements and environmental SO_x or NO_x gases. Sulfur oxides and nitrogen oxides cause acid rain and have become a serious problem for the environment. Thus, many researchers are motivated to use CFA mixed with other minerals such as CaO or Ca $(OH)_2$. Allen and Hayhurst (1996) used CaO to minimize SO_2 production, producing $CaSO_4$, which is comparably less cost-effective than the wet and semi-dry processes for desulfurization. Additionally, CFA has been explored as a cheap sorbent material for flue gas desulfurization either in pure or mixed form with desired minerals. $Ca(OH)_2$ mixed with CFA has been studied for increased efficiency of SO_2 adsorption, while CaO has been applied to treat SO_2 in water (at room temperature) as a low-cost desulfurization method by Li et al. (2017). Similarly, activated carbon has been widely used to adsorb heavy metal elements from wastewater; however, its limited availability is a major issue for its extensive use. Therefore, CFA has been converted as an effective adsorbent and employed as an economically desired material for the remediation of toxic substances from industries, laboratories, and wastewater. Gupta and Sharma (2003) used bagasse CFA (sugar industries waste) to clean Zn ions from water by evaluating the kinetic rate of adsorption. The active surface sites of the ferrosphere permit stronger chemisorption due to the larger area, which explains the adsorption effects. However, the porous nature of the outer surface also contributes to adsorbing organic and inorganic molecules or elements during water or air cleaning. Particle diffusion and accumulation on the porous structure have gained considerable attention in CFA extraction and its importance in purification chemistry. External and internal transport occur by involving both open-surface sites and porous structures. The kinetics of adsorption are often rapid; thus, many theoretical approaches have been employed to investigate the rate-determining steps.

In this regard, a modified procedure was adopted by Decker and Klabunde (1996)and Yang et al., in which around 4% of Fe_2O_3 was mixed with CaO to adsorb SO_2 (Georgiadis et al., 2020). They found almost double reactivity for the adsorption due to the use of combined CaO/Fe_2O_3, and reported it as a destructive absorbent for sulfur dioxides. The FS and other constituents were identified as suitable destructive agents for toxins, including chlorinated hydrocarbons such as $CHCl_3$, CCl_4, C_2Cl_4, C_2HCl_3, and acid gases (SO_2, CO_2, HCl, and SO_3). Spherical and narrow particles show specific reactivities toward toxic pollutants, is a more effective technique for air and water treatments using CFA and its derivatives. Organic dyes are also degraded by waste material bottom ash. The concentration of adsorbents and treatment time play crucial roles in the adsorption kinetics. The same evidence was addressed by

Gupta et al. (2008). The heterocyclic and aromatic compounds removed by utilizing such CFA derivatives and a wider research potential were highlighted in this sector. To investigate the geometric and physicochemical features of CFA/particles, Peloso et al. removed toluene vapor using CFA particles (Peloso et al., 1983). A satisfactory performance for toluene adsorption was obtained due to the chemical activation, total porosity, and specific surface area of the sorbent. Furthermore, the adsorption kinetics of volatile aromatic hydrocarbons and x-xylene were investigated by Rothenberg et al. (1991), who showed that the reactivity on pore structure was impactful for adsorbing these organic substances in gaseous form. The adsorption rate is mainly regulated by the diffusion process, while the partitioning of gaseous aromatic compounds depends upon the particle sizes, vapor pressure, temperatures, etc. Therefore, by utilizing such CFAs and their derived value-added minerals, various environmental issues could be resolved to make human lives healthier and easier by minimizing carcinogenic and mutagenic effects (caused by heterocyclic/aromatic toxic contents) by controlling air and water quality (Umejuru et al., 2021).

7.2.4 Applications of ferrospheres and plerospheres in defense systems

Several reports have described the use of the whole CFA or its components separately for defense and military purposes. CFA-based civil products like bricks and blocks are light in weight and can be directly used for the rapid construction of army base camps. Moreover, the light weight allows easy transportation (Varshney et al., 2022). Additionally, CFA-based bricks require less water during building or construction; thus, they are beneficial for army personnel for utilization in hilly or desert areas with limited water present. Due to the presence of ferrous particles, cenospheres, and plerospheres, this could be used as a material with high mechanical strength. It is used as a filler in several army-utilizable products. Additionally, the separate components, such as FS, have been used for the development of magnetic-based materials due to their magnetic properties. The most widely used particles are CS, which are very lightweight, with high mechanical strength and excellent electromagnetic properties. Both PS and CS are commonly used in defense radar systems due to their electromagnetic (EM) properties and are also being used as a substitute for CNTs in the development of lightweight materials in aircrafts. Various nanocomposites developed using CFA products have also been used for military purposes (Yadav and Fulekar, 2019; Yadav and Pandita, 2019; Yadav et al., 2020b).

CFA or cenospheres, plerospheres, and ferrospheres could also be used for the detection of toxic or radioactive substances by surface functionalizing of these particles to act as sensing materials. CFA-based products could be coated with specific chemicals for the detection of any chemical gases released by an enemy army. Moreover, cenospheres, ferrospheres, and plerospheres could be used by the army as sensing or detection agents in tunnels where chemical weapons, hazardous gases, or any liquid chemicals might have been placed by an enemy army (Choudhary et al., 2020; Yadav et al., 2021b).

8 Conclusion

Due to the variation in temperature of the furnace in thermal power plants, different zones are created. Consequently, morphologically different CFA structures are formed; i.e., ferrospheres, cenospheres, and plerospheres, which are mainly nearly spherical in shape. These spherical structures vary in their chemical composition and inner or outer structures. Although coal is a mixture of organic and inorganic compounds, it is dominated by organic compounds which, upon decomposition, produce these spherical structures. Among these spherical structures, ferrous-rich ferrospheres exhibit magnetic properties due to the depositions of iron oxides on their surfaces. These deposited iron oxides are mainly crystalline in nature, belonging to magnetite, maghemite, and hematite phases. Among these spheres, ferrospheres show maximum diversity, including rough, smooth, polygon, dendritic, granular, or molten drop, and range in size from a few nanometers to several microns. The fly ash extracted from unmodified ferrospheres has applications in metallurgy, ore dressing, and catalysis. Plerospheres are double-layered solid spherical particles, in which the outer and larger spheres trap numerous microspheres or mineral fragments. Based on the plerosphere wall thickness, it is categorized as thin- or thick-walled. The thickness of plerospheres is due to the coating of minerals or carbon at higher temperatures in the furnace. Plerospheres are used in engineering, military, ceramics, and wastewater treatment applications due to their unique and remarkable properties.

Author contributions

VY, NC, GI, SW, TM, and AG: original draft, manuscript writing and review, data curation, formal analysis, and investigation. MA, KY, M-KJ, B-HJ, and AA: conceptualization, validation, manuscript writing and review, software, visualization, project administration, and funding acquisition. VY, B-HJ, and TM, supervision, methodology, and resources. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Review

Recent advances and mechanism of antimicrobial efficacy of graphene-based materials: a review

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ABSTRACT

Graphene-based materials have undergone substantial investigation in recent years owing to their wide array of physicochemical characteristics. Employment of these materials in the current state, where infectious illnesses caused by microbes have severely damaged human life, has found widespread application in combating fatal infectious diseases. These materials interact with the physicochemical characteristics of the microbial cell and alter or damage them. The current review is dedicated to molecular mechanisms underlying the antimicrobial property of graphene-based materials. Various physical and chemical mechanisms leading to cell membrane stress, mechanical wrapping, photo-thermal ablation as well as oxidative stress exerting antimicrobial effect have also been thoroughly discussed. Furthermore, an overview of the interactions of these materials with membrane lipids, proteins, and nucleic acids has been provided. A thorough understanding of discussed mechanisms and interactions is essential to develop extremely effective antimicrobial nanomaterial for application as an antimicrobial agent.

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