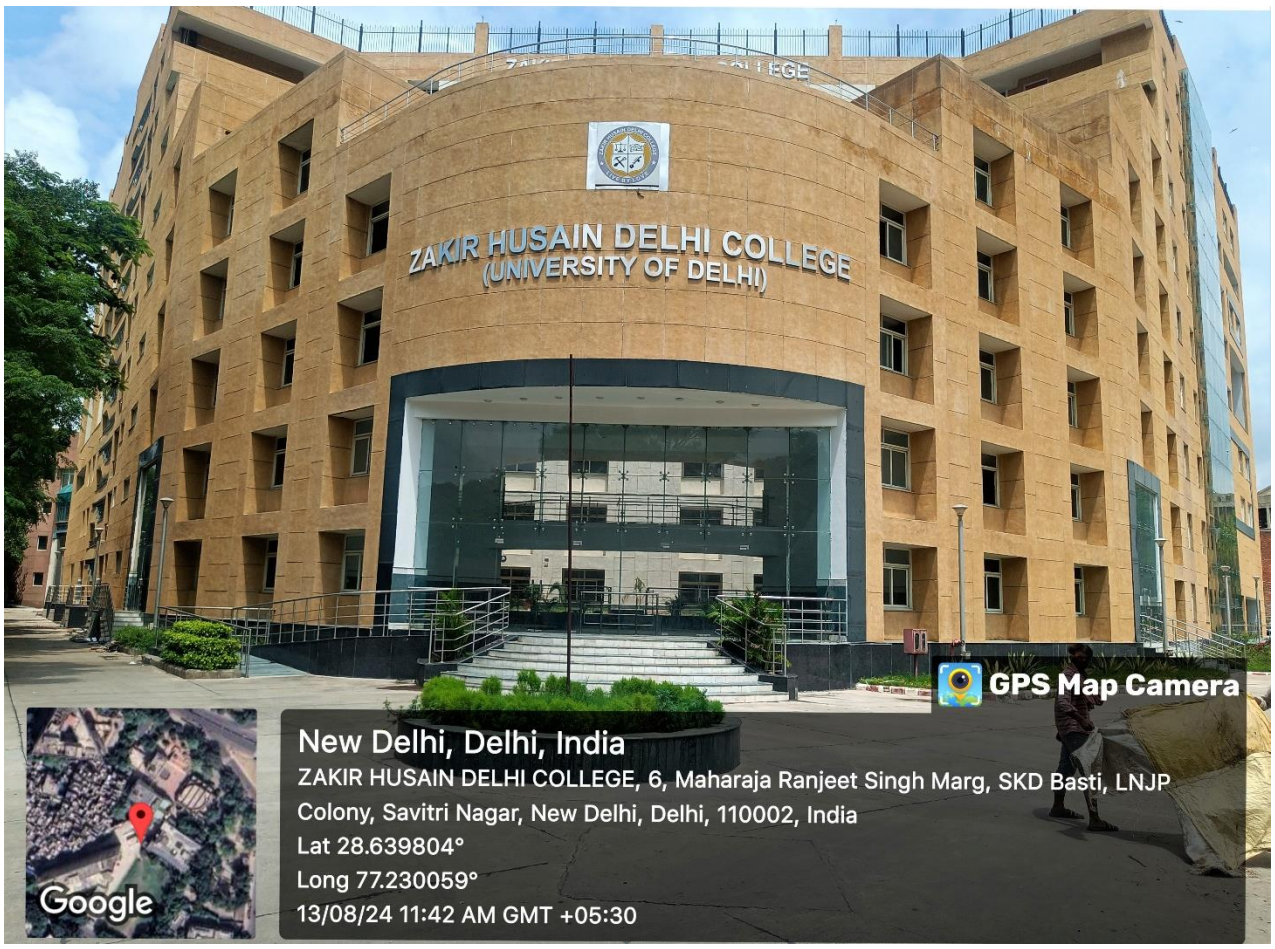
ZAKIR HUSAIN DELHI COLLEGE
UNIVERSITY OF DELHI



SUPPORTING DOCUMENT: 3.5.1

Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during 2022-23

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Certificate No.	:	IN-DL673465230327l6U
Certificate Issued Date	:	29-Jul-2022 04:25 PM
Account Reference	:	IMPACC (IV)/ dl908703/ DELHI/ DL-DLH
Unique Doc. Reference	:	SUBIN-DLDL908703168141502574 67U
Purchased by	:	SAKSHAM INDERPRASTHA
Description of Document	:	Article 58 Memorandum of Settlement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	ZAKIR HUSAIN DELHI COLLEGE
Second Party	:	SAKSHAM INDERPRASTHA
Stamp Duty Paid By	:	SAKSHAM INDERPRASTHA
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

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116

Please write or type below this line

MEMORANDUM OF UNDERSTANDING

This Memorandum of understanding/Association is executed on this 29th day of July, 2022

BETWEEN

ZAKIR HUSAIN DELHI COLLEGE, JAWAHARLAL NEHRU MARG, NEW DELHI-110002 UNIVERSITY OF DELHI, hereinafter referred to as the '*First Party*'

AND

SAMDRUSHTI KSHAMTA VIKAS EVAM ANUUSANDHAN MANDAL (SAKSHAM INDERPRASTHA) NUTAN SHIKSHA SADAN, 603/8, MOTI RAM ROAD, SHAHDARA, DELHI-110032; hereinafter referred to as the '*Second Party*'.

(Hereinafter collectively referred to as "The Parties")

WHEREAS, The first party is a reputed college running under the affiliation of Delhi University, which is interested to modify its premises to make it easy accessible and to create a comfortable atmosphere for specially challenged persons who are suffering with different physical & mental disabilities,

WHEREAS, The second party is a well-known NGO have been engaged in the service of specially challenged persons since long time and working for creating awareness off the rights of disabled persons everywhere including educational institutions and extending their support in creating infrastructure required,

WHEREAS, both the parties having similar ideas came to an understanding to work together for the betterment of specially challenged persons mobility, to empower the Persons with disabilities (PwD's).

AND WHEREAS, both the parties agreed to jointly organize programs, camps seminars etc. in the field of disability and to modify the college premises easily accessible to Persons with disabilities (PwD's).

AND WHEREAS, both the parties agreed that they will abide by all the conditions mentioned herein and committed to implement them without any deviations and violations.

AND WHEREAS, none of the provisions to this MOU shall be deemed to constitute a partnership in commerce in between the parties here but they both just partners in service, hence no contractual obligations will arise,

WHEREAS, the 1st party agreed to implement the rights of disabled persons as per law and the second party agreed to guide them while implementing the same, A detailed implementation plan may be drawn by both the parties to this MOU.

AND WHEREAS, both the parties mutually agreed to alter the conditions any time as per the circumstances required for further expansion.

AND WHEREAS, it is being agreed and understood by the parties that data, know-how and any other such proprietary information that was provided or agreed to be provided by either party, will remain confidential.

AND WHEREAS, this MOU is at-will and may be modified by mutual consent of authorized officials of the parties. This MOU shall become effective upon signature by the authorized officials from both the parties and will remain in effect for two years until modified or terminated by any one of the parties by mutual consent. After this period, it may be extended by the parties on mutual agreement in writing until it is rescinded.

NOW THIS MEMORANDUM OF UNDERSTANDING/ AGREEMENT WITNESSETH AND IT IS HERE BY AGREED BY AND BETWEEN THE PARTIES HERE TO AS FOLLOWS:-

1. That both the parties agreed to jointly promote the quality of academic research for policy making in respect of Persons with Disabilities (PwD's).
2. That both the parties to this MOU will jointly work for making college campus into a Divvying friendly environment and it is agreed between both parties that this Memorandum of Understanding is meant and agreed for the staff and students of Zakir Husain Day College and it shall not

involve/incurred any financial liability on the First Party (i.e. Zakir Husain Delhi College).

3. That both the parties to this MOU will jointly organize academic, cultural, social and sport related activities and for enhancing intellectual awareness & sensibility for PWD persons for their multi-faceted development.

4. That both the parties agreed to work jointly for providing quality reading material, stationary and innovative technological access for Persons with disabilities (PwD's)

5. That both the parties to this MOU will work together to spread awareness between the masses for eye donation, blood donation, organ donation etc. to minimize eradicate disability.

6. That both the parties to this MOU will help each other to provide the best academic research and services to encourage and improve the professional and technical skills in Persons with disabilities (PwD's).

7. That both the parties to this MOU will jointly work for making Persons with disabilities (PwD's) self-dependent (Atma Nirbhar) through providing skill training including improvement and cherishment of various traditional Hunar (skill), etc.

8. That the first party further agreed to undertake the following responsibilities:-

   a. The first party shall provide recording studio for preparing, updation, maintenance and preservation and upgradation of audio books of various academic/ non-academic resources for Persons with disabilities (PwD's).

   b. The first party shall arrange volunteers from college for recording audio books for Persons with disabilities (PwD's).

   c. The first party shall provide space in college premises for organizing disability awareness and sensitization programs.

d. The first party shall organize the eye donation, organ donation and blood donation camps with the help of second party.

e. The first party shall include in their college guidelines that making short films documentaries as a project upon various disability related issues to the students as obligatory with special incentives.

f. The first party shall provide refreshment and assistance to doctors and other professionals, various resource persons, volunteers and other working personnel's including attendees during various awareness/ sensitization programs and recording sessions

9. That the second party through its authorized personnel shall undertake the following responsibilities :-

a. The second party shall provide public awareness and support with the help of concerned professionals/experts in all disability related issues.

b. The second party shall co-ordinate with Persons with disabilities (PWD's) to assist them in acquiring reading material, stationary and technological access on time.

c. The second party shall provide certificates to those students/ volunteers which are working for Diyangjan's welfare.

d. The second party shall preserve and maintain the audio recording of various academic/ non- academic resources for their future and sustainable use for visually impaired persons.

e. The second party shall ensure that all recordings of various academic/ non-academic resources will be easily accessible and provided free of cost to Persons with disabilities (PwD's). No one will be allowed to use these recordings for commercial purposes

f. The second party shall provide volunteer support for organizing disability awareness programs.

g. The second party shall organize time to time career guidance and employment programs including assistance for various competitive exams to Persons with disabilities (PwD's).

h. The second party shall try to cure and provide assistive devices to make the PWD PERSONS self-dependent, if any disability detected in any of college students.

i. The second party shall help for promoting and adapting of new and emerging sciences, technological innovations such as Artificial Intelligence (AI), Robotics and edge computing, etc.

IN WITNESS WHEREOF the parties hereto have set their respective hands on these presents on the day, month and year first written above in the presence of the following witnesses.

WITNNESSES:

AUTHORISED SIGNATORY
FIRST PARTY

1.

Prof. Narendra Singh
Zakir Husain Delhi College

2.

AUTHORISED SIGNATORY
SECOND PARTY

Sh. Tribhuvan Singh Rawat
State Sr. Vice President
Saksham Inderprastha

GANDHI STUDY CIRCLE

Under the Aegis of Internal Quality Assurance Cell (IQAC)

ZAKIR HUSAIN DELHI COLLEGE
(UNIVERSITY OF DELHI)

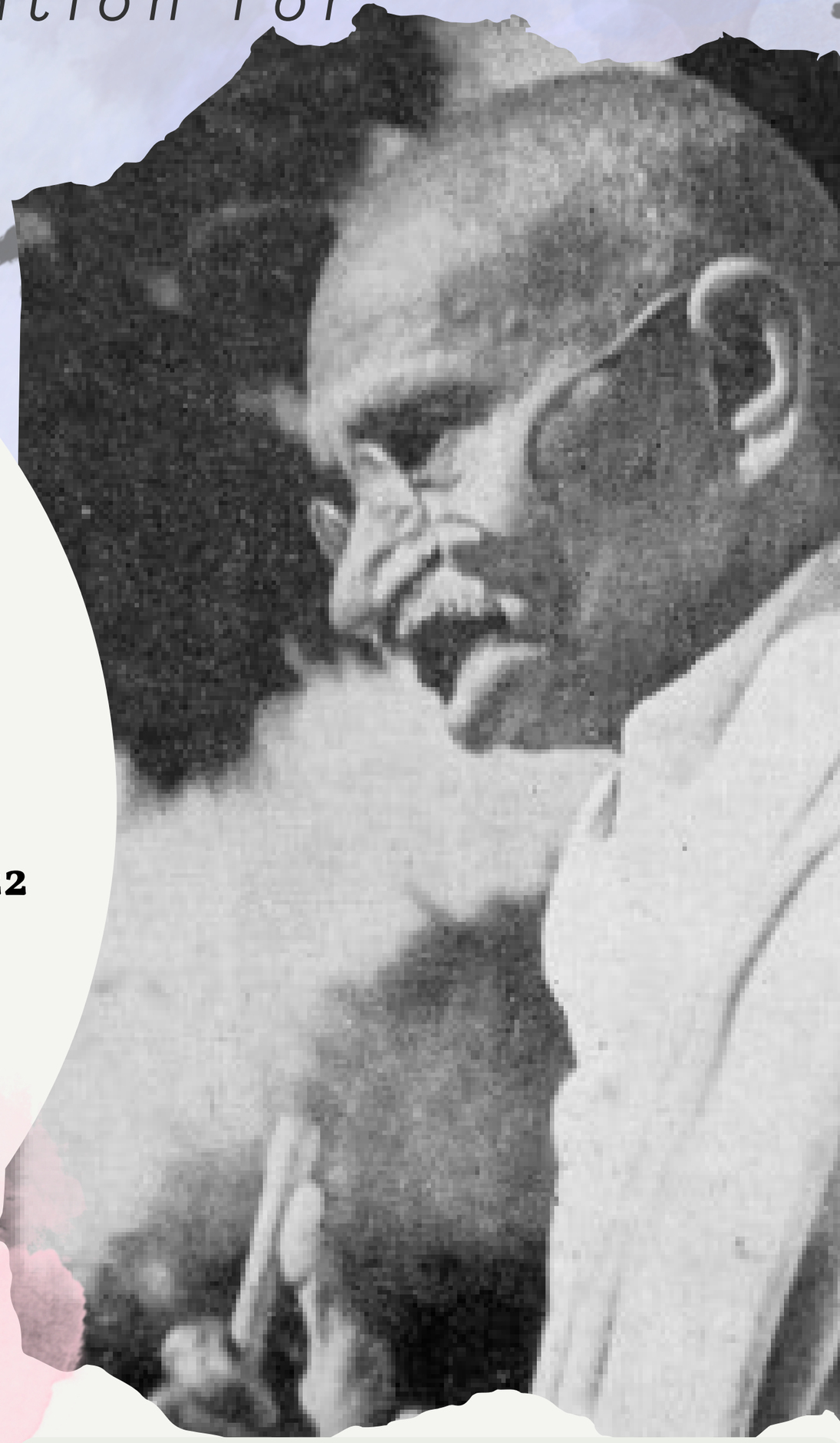
And

GANDHI SMRITI AND DARSHAN SAMITI
(MINISTRY OF CULTURE)

invites application for

Value Added
Certificate Course
On

NON-VIOLENT COMMUNICATION



EXTENDED DATE TO APPLY- 15th December 2022

Tap the icon to register

For queries, tap to email

Student Program Coordinators

Priyanshu : +91 96507 72476
Ayush : +91 93367 80373

PROF. NARENDRA SINGH
PRINCIPAL

DR. SANJEEV KUMAR
CONVENER, GSC

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THE SEAL OF NOTARY PUBLIC ★ ADVOCATE ★ Abhinay Gupta Appointed by Govt. of India

THE SEAL OF NOTARY PUBLIC ★ ADVOCATE ★ Abhinay Gupta Appointed by Govt. of India

दीपंकर श्री ज्ञान/Dipankar Shri Gyan, IAS
निदेशक/Director
गांधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti

Statutory Alert:
1. The authenticity of this Stamp certificate should be verified at 'www.shcilestamp.com' or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

Memorandum of Understanding

This Memorandum of Understanding is for a collaborative effort in leveraging knowledge, academic and research expertise and institutional strengths of Gandhi Smriti and Zakir Husain Delhi College, University of Delhi to promote research, skilloriented courses and progrmmnes based on Gandhian principles.

Between:- Zakir Husain Delhi College, University of Delhi.

AND

Gandhi Smriti and Darshan Samiti(GSDS)

GSDS formed in September 1984 is an autonomous body u functioning under the Ministry of Culture, Government of India. Its overarching goal is to promote the life and message of Mahatma Gandhi. The Prime Mister of India is its Chairperson and it has the following objectives:-

i. To plan and carry out activities for the promotion of Gandhian ideals and philosophy.

ii. To Keep Gandhi Smriti and Darshan Samiti open for public as per standard rules related to museum and maintain it to provide maximum convenience to visitors.

iii. Promote Audience Development and Museum Management Framework in both Gandhi Smriti Museum and Gandhi Darshan Exhibition.

iv. Promote initiative to create awareness on the life and massage of Mahatma Gandhi through educational media like exhibition, films. Gandhiana Posters, and different forms of Act, Culture and Technology

v. To develop and preserve a liberary of books including rare books literature, photographs films and documents etc.

vi. To collect, preserve and exhibit important relics of Mahatma Gandhi.

vii. Focus on empowering the marginalized through different activitis related to philosophy and ideals of Mahatma Gandhi.

ADVOCATE * THE SEAL OF NOTARY PUBLIC * Abhinay Gupta Appointed by Govt. of India

cont.2/p...

PRINCIPAL ZAKIR HUSAIN DELHI COLLEGE JAWAHAR LAL NEHRU MARG NEW DELHI-110002

दीपंकर श्री ज्ञान/Dipanker Shri Gyan, I.
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Sam
नई दिल्ली-110002/New Delhi-110002

viii.

ix. Developing capacities of children, youth, women and other groups for imbibing Gandhian values and work to bring attitudinal change/ development through practical applications of Gandhian Philosophy.

x. To restore, protech and manage both the emploexes at Gandhi Darshan and Gandhi Smriti and all movable and immovable properties therein according to requirement.

xi. To bring publication for various sections of people toenhance their knowledge about Mahatma Gandhi and the velues he propagated.

xii. Encourage and promote Gandhian perspectives on education and facilitate e ucation for peace, ecological security, equality and justice.

xiii. To conduct inter-disciplinary research on Gandhian philosophy in the context of contemporary issues.

xiv. To work extensively with different Universities and Academic institutions for better and in -depth understanding of Mahatama Gandhi and Gahian philosophy.

xv. Empowerment of the weaker sections of the society through vocational training programmes and other livelihood initiatives as part of Gandhain constructive work.

xvi. Respond and work to address challenging problems of the society.

xvii. Involving different stakeholders to work for a culture of collective living collective working, peace and nonviolence.

xviii. Reaching the unreached with thelife and message of Mahatama Gandhi especially in far flung areas.

xix. To undertake such other activities and to do all the foregoing mandate and to cooperate and seek cooperation from other institutions for the aforesaid purposes.

THE SEAL OF NOTARY PUBLIC
Abhinay Gupta
Appointed by
Govt. of India

cont.3/p...

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MARG
NEW DELHI-110002

Dipanker Shri Gyan,
दीपंकर श्री ज्ञान/Director
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti
नई दिल्ली-110002/New Delhi-110002

Zakir Husain Delhi College, University of Delhi

Zakir Husain Delhi College is one ofthe leading college of University of Delhi imparting higher education in Science, Commerce, Humanities and Social Sciences. The college holds the distinction of being in existence well before the existence of University ofDelhi. It carries within iteself a history of nearly 300 years as an institution of learning . The college was affiliated to Delhi University in 1925 and became one of ihs constituent degree college. Following the partition of India, the Delhi College wqs revived a a non-denominational institution in 1948 and was renamed Zakir Husain college after 1975 and managed by the Zakir Husain Memorial Trust under the Chairmanship of Prime Minister of India. Today the collge runs undergraduate courses in 21 disciplines and offers 17 post graduate courses. The College is Accrediated with "A" Grade by NAAC.

Vision:

To be a centre of Excellence in Teaching, Learning and Research and hence to improve the Quality of Education and knowledge.

MISSION:

- To provide Quality Research Facilities in the college.
- To provide Consultancy services to Industries Govenment/ Semi Government Organizations and other Agencies.
- To encourage Sill Develppment and Entrepreneurship among the Students.

The Objective of the Memorandum of Understanding:-

The objectives of the MOU are to entire into a strategic collaboration to jointly initiate academic programmers and research.
Specifically, in the initial phase, the Focus of work would be to initiate the following.

I) Short Term Certificate course on Nonviolent Communication and Peer Mediation in both Graduation and Masters Level.

II) Help Organize Extension lectures and training programmes, initiate research and publication bases on Gandhain Principles.

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Scope of the Partnership: -

I) For the course non Nonviolent Communication and Peer Mediation the Samiti is already running a highly successful online course having global tractions.As nonviolent communication is identified as an essential life skill, all students of the Zakir Husain Delhi College and others students from University of Delhi and other colleges in India and benefit from it.

Implementation Arragement

The course will be useful for all thestudents in different disciplines. the Students will be expected to give a qualifying exam to be eligible for certificate. The students can be charged a nominal fee as examination and certificate charges. Joint certificate with GSDS and the Zakir Husain Delhi College will be given.

Both the organizations will jointly organize lectures/workshops/ introduce other innovative strategies to help students understnad the importance of nonviolent communication in their daily lives.

Financials:

A portion of the amount received from exmination and certificate charges could go to GSDS to facilitate regular videos/innovative activities for the students, which can be mutually agreed upon after discussion at suitable forums in both the institutions.

Implementation Arrangements:-

The Zakir Husain Delhi college will Identify a Nodal officer who will directly work with the officers of GSDS to facilitiate the successful running the course/lectures/other activities as part of the course.

Duration :- Initially the agreement will be for three years.

Conflict Resolution: Any disputes will be resolved through mutual discussions and negotiations.

Termination:- In case of the need for termination, the MOU can be terminated through mutually agreeable terms.

ADVOCATE * THE SEAL OF NOTARY PUBLIC * Abhinay Gupta Appointed by Govt. of India

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MARG
NEW DELHI-110002

Dipanker Shri Gyan, JAS
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti
नई दिल्ली-110002/New Delhi-110002

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This memorandum of understanding is signed in presence of the witness mentioned below at New Delhi on this 25th Day of February 2022.

Witnesses:-

1

Dr. Sanjeev Kumar
Convener, Gandhi Study Circle
Zakir Husain Delhi College
University of Delhi
New Delhi-110002

2.

Dr. Vedabhyas Kundu
Programme Officer,
Gandhi Smriti and Darshan Samiti
New Delhi.

Executant

25.02.2022

Prof. Sangeeta Pandita
Principal,
Zakir Husain Delhi College
University of Delhi
New Delhi-110002

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MG
NEW DELHI-110002

Dipanker Shri Gyan
Director
Gandhi Smriti and Darshan Samiti(GSDS), New Delhi
110002.

दीपंकर श्री ज्ञान/Dipanker Shri Gyan, JAS
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti
नई दिल्ली-110002/New Delhi-110002

THE SEAL OF NOTARY PUBLIC ★ ADVOCATE ★
Abhinay Gupta
Appointed by
Govt. of India

ATTESTED

NOTARY PUBLIC

25 FEB 2022

INTERNSHALA
internships that matter

internshala.com
+91 124 4367427
+91 124 4004123
university.relations@internshala.com

Scholiverse Educare Pvt. Ltd.
B-610, Unitech Business Zone,
Gurgaon, Haryana – 122018
CIN: U80901HR2011PTC064443

INTERNSHALA COLLEGE REGISTRATION AGREEMENT

This Agreement is executed on 03-02-2023 by and between:

Scholiverse Educare Private Limited, having its registered office at B-610, Unitech Business Zone, Nirvana Country, Sector-50, Haryana - 122018, acting through its authorized representative Ms. Aayushi Sharma, Head, University Relations (hereinafter referred to as **"Internshala"**);

AND

Zakir Husain Delhi College (University of Delhi) (hereinafter referred to as the "**College**" which expression shall, unless repugnant to the meaning or context thereof, be deemed to include its executors, representatives and permitted assigns) of the other Party; acting through its authorized representative Prof. Narendra Singh, Principal.

Internshala and College may be referred to as 'Party' individually and as 'Parties' collectively, as the context may require.

Overview:
This agreement is regarding the college registration of 'Zakir Husain Delhi College (University of Delhi)' with 'Internshala'.

Responsibilities of Internshala:

- Create student accounts for all the students registered by the College.
- Provide weekly internship update to all the students registered by the College as per their filled in preferences
- Provide an online resume maker to all the students of the College registered with Internshala.
- Safeguard students' data as per Internshala privacy policy (https://internshala.com/privacy)
- Inform the college when students get selected for an internship.
- Provide College with Internshala logo and brand name to be used in College's communications (internal or external) and on its website to recognize Internshala as the internship and training partner and any other purpose limited to the scope of the agreement.

Responsibilities of College:

- Recognize Internshala as the internship and training partner in all internal and external communications including on its website and in admission/media brochures.
- Send a communication to all the students and faculties regarding the association and direct/encourage students to verify their accounts.
- Provide the information of all the interested students of the College as required by Internshala for their registration. The information should contain the first name, last name, mobile number and the email address of all the students of the College.
- Regularly post a list of students selected for internships through Internshala every month on the college's notice board.
- Authorize Internshala to recognize college, using College logo and/or brand name, as a registered user in its communications (internal or external) and on Internshala platform only for the purpose limited to the scope of the agreement.

Commercials:
This is a non-commercial agreement whereas neither party is required to make any payment to other party for carrying out the responsibilities listed in this agreement.

Term and Termination:
This agreement will be operational and valid from 03-02-2023 and the initial tenure of the agreement is 1 (one) year. Upon completion of the tenure, the agreement can be renewed for another 1 year and so on with mutual consent of both parties.
Under normal circumstances, either party wanting to terminate the agreement can do so and it can be done on a mutually agreed upon date in a justified way with a notification given at least one month prior to termination date.

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21/02/23

INTERNSHALA
internships that matter

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Gurgaon, Haryana – 122018
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Indemnity

The college understands and agrees that all the information provided on Internshala related to internships and trainings is provided on *as is* basis. It further agrees that while Internshala makes efforts to ensure the accuracy of the information supplied, it does not guarantee it and the college will choose to disseminate this information to its students solely at its discretion. The college agrees to defend, indemnify and hold harmless Internshala, its subsidiaries, affiliates, licensors, employees, agents, third party information providers and independent contractors against any loss, claims, damages, costs, liabilities and expenses (including, but not limited to, reasonable attorneys' fees) arising out of or related to its use of content of Internshala platform feed that it posts, stores or otherwise transmits on or through its platform(s) or to its students or to general public at large.

The college understands and agrees that as a platform, Internshala acts as a bridge between the organizations who wish to hire interns and the students who wish to apply for the internships. We make best efforts to bring the best internships on the platform, educate students about the same and ensure that they can apply to these internships in a seamless manner. However, the eventual hiring decision, rightfully, resides with the organization which is hiring interns and is dependent on several factors such as the skills of the applicant, quality of her applications, competition, requirements and assessment process of the organization, student's availability at the required location and for the desired period of the internship etc. Since these factors are beyond Internshala's control, Internshala does not and can not guarantee an internship to an applicant.

The college further agrees to indemnify and hold harmless Internshala, its subsidiaries, affiliates, licensors, employees, agents, third party information providers and independent contractors, if any, who controls any thereof, against any loss, liability, claim, damage and expense whatsoever (including, but not limited to, any and all expenses whatsoever reasonably incurred in investigating, preparing or defending against any litigation commenced or threatened or any claim whatsoever) arising out of or based upon any false representation or warranty or breach or failure by the College to comply with any covenant or agreement made by the College herein or in any other document furnished by the College to any of the foregoing in connection with this agreement.

Trademarks:

Except to the limited extent expressly provided in this Agreement, neither Party grants, nor the other Party will not acquire any right, title or interest (including, without limitation, any implied license) in or to any property of the first Party. All rights not expressly granted herein are deemed withheld. All use by a Party of the other trade names, trademarks, service marks, logos, etc., and any goodwill associated therewith, will inure to the benefit of the grantor.

Confidentiality:

Internshala and the College will not disclose the details of this agreement and any private information that they come across when this agreement is in effect to any third-party.

If either Party (the "Receiving Party") under this Agreement gains access to confidential information of the other Party (the "Disclosing Party") concerning the Disclosing Party's prices, business, plans, technology, products, and other non-public information of the Disclosing Party (collectively, "CI" or "Confidential Information"), then the terms of this section will apply. CI includes all information in tangible or intangible form that is marked or designated as confidential by the Disclosing Party or that, under the circumstances of its disclosure, should be considered confidential. The Disclosing Party owns all right, title and interest, including all patent, copyright, trademark, trade secret rights and any other intellectual property or proprietary rights in any jurisdiction, including any and all applications, renewals, extensions and restorations thereof, in the Disclosing Party's CI. Each Party agrees that it will not use in any way, for its own benefit or the benefit of any third party, except as expressly permitted by, or as required to implement, this Agreement, nor disclose to any third party (except as required by law or to such Party's attorneys, accountants and other advisors as reasonably necessary), any of the Disclosing Party's CI. Each Party will take reasonable precautions to protect the confidentiality of the other Party's CI that are at least as stringent as it takes to protect its own CI.

INTERNSHALA
internships that matter

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CIN: U80901HR2011PTC064443

Force Majeure:

Except for any payment obligations, neither Party will be liable to the other for failure to fulfill obligations hereunder if such failure is due to causes beyond its control, including, without limitation, acts of God, earthquake, fire, flood, embargo, catastrophe, sabotage, utility or transmission failures, governmental prohibitions or regulations, national emergencies, insurrections, riots or wars, strikes, work stoppages or other labor difficulties ("Force Majeure Event"). The time for any performance required hereunder will be extended by the delay incurred as a result of such Force Majeure Event.

Disputes:

The Parties shall attempt in good faith to resolve any dispute arising out of or relating to this Agreement promptly by negotiation between executives.

Signed and Delivered by The Signatory Representative of Parties to this agreement:

For and on behalf of

Internshala

Scholiverse Educare Pvt. Ltd. Gurgaon

(Aayushi Sharma, Head - University Relations)

(Authorized Signatory)

Zakir Husain Delhi College (University of Delhi)

(Prof. Narendra Singh, Principal)

(Authorized Signatory)

आचार्य/Principal
जाकिर हुसैन दिल्ली महाविद्यालय
Zakir Husain Delhi College
दिल्ली विश्वविद्यालय/University of Delhi
नई दिल्ली-११०००२/New Delhi-110002

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MEMORANDUM OF UNDERSTANDING

This Memorandum of understanding/Association is executed on this 29th day of July, 2022

BETWEEN

ZAKIR HUSAIN DELHI COLLEGE, JAWAHARLAL NEHRU MARG, NEW DELHI-110002 UNIVERSITY OF DELHI, hereinafter referred to as the '*First Party*'

Statutory Alert:
1. The authenticity of this Stamp certificate should be verified at "www.shcilestamp.com" or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

AND

SAMDRUSHTI KSHAMTA VIKAS EVAM ANUUSANDHAN MANDAL (SAKSHAM INDERPRASTHA) NUTAN SHIKSHA SADAN, 603/8, MOTI RAM ROAD, SHAHDARA, DELHI-110032; hereinafter referred to as the '*Second Party*'.

(Hereinafter collectively referred to as "The Parties")

WHEREAS, The first party is a reputed college running under the affiliation of Delhi University, which is interested to modify its premises to make it easy accessible and to create a comfortable atmosphere for specially challenged persons who are suffering with different physical & mental disabilities,

WHEREAS, The second party is a well-known NGO have been engaged in the service of specially challenged persons since long time and working for creating awareness off the rights of disabled persons everywhere including educational institutions and extending their support in creating infrastructure required,

WHEREAS, both the parties having similar ideas came to an understanding to work together for the betterment of specially challenged persons mobility, to empower the Persons with disabilities (PwD's).

AND WHEREAS, both the parties agreed to jointly organize programs, camps seminars etc. in the field of disability and to modify the college premises easily accessible to Persons with disabilities (PwD's).

AND WHEREAS, both the parties agreed that they will abide by all the conditions mentioned herein and committed to implement them without any deviations and violations.

AND WHEREAS, none of the provisions to this MOU shall be deemed to constitute a partnership in commerce in between the parties here but they both just partners in service, hence no contractual obligations will arise,

WHEREAS, the 1st party agreed to implement the rights of disabled persons as per law and the second party agreed to guide them while implementing the same, A detailed implementation plan may be drawn by both the parties to this MOU.

AND WHEREAS, both the parties mutually agreed to alter the conditions any time as per the circumstances required for further expansion.

AND WHEREAS, it is being agreed and understood by the parties that data, know-how and any other such proprietary information that was provided or agreed to be provided by either party, will remain confidential.

AND WHEREAS, this MOU is at-will and may be modified by mutual consent of authorized officials of the parties. This MOU shall become effective upon signature by the authorized officials from both the parties and will remain in effect for two years until modified or terminated by any one of the parties by mutual consent. After this period, it may be extended by the parties on mutual agreement in writing until it is rescinded.

NOW THIS MEMORANDUM OF UNDERSTANDING/ AGREEMENT WITNESSETH AND IT IS HERE BY AGREED BY AND BETWEEN THE PARTIES HERE TO AS FOLLOWS:-

1. That both the parties agreed to jointly promote the quality of academic research for policy making in respect of Persons with Disabilities (PwD's).
2. That both the parties to this MOU will jointly work for making college campus into a Divvying friendly environment and it is agreed between both parties that this Memorandum of Understanding is meant and agreed for the staff and students of Zakir Husain Day College and it shall not

involve/incurred any financial liability on the First Party (i.e. Zakir Husain Delhi College).

3. That both the parties to this MOU will jointly organize academic, cultural, social and sport related activities and for enhancing intellectual awareness & sensibility for PWD persons for their multi-faceted development.

4. That both the parties agreed to work jointly for providing quality reading material, stationary and innovative technological access for Persons with disabilities (PwD's)

5. That both the parties to this MOU will work together to spread awareness between the masses for eye donation, blood donation, organ donation etc. to minimize eradicate disability.

6. That both the parties to this MOU will help each other to provide the best academic research and services to encourage and improve the professional and technical skills in Persons with disabilities (PwD's).

7. That both the parties to this MOU will jointly work for making Persons with disabilities (PwD's) self-dependent (Atma Nirbhar) through providing skill training including improvement and cherishment of various traditional Hunar (skill), etc.

8. That the first party further agreed to undertake the following responsibilities:-

   a. The first party shall provide recording studio for preparing, updation, maintenance and preservation and upgradation of audio books of various academic/ non-academic resources for Persons with disabilities (PwD's).

   b. The first party shall arrange volunteers from college for recording audio books for Persons with disabilities (PwD's).

   c. The first party shall provide space in college premises for organizing disability awareness and sensitization programs.

d. The first party shall organize the eye donation, organ donation and blood donation camps with the help of second party.

e. The first party shall include in their college guidelines that making short films documentaries as a project upon various disability related issues to the students as obligatory with special incentives.

f. The first party shall provide refreshment and assistance to doctors and other professionals, various resource persons, volunteers and other working personnel's including attendees during various awareness/ sensitization programs and recording sessions

9. That the second party through its authorized personnel shall undertake the following responsibilities :-

a. The second party shall provide public awareness and support with the help of concerned professionals/experts in all disability related issues.

b. The second party shall co-ordinate with Persons with disabilities (PWD's) to assist them in acquiring reading material, stationary and technological access on time.

c. The second party shall provide certificates to those students/ volunteers which are working for Diyangjan's welfare.

d. The second party shall preserve and maintain the audio recording of various academic/ non- academic resources for their future and sustainable use for visually impaired persons.

e. The second party shall ensure that all recordings of various academic/ non-academic resources will be easily accessible and provided free of cost to Persons with disabilities (PwD's). No one will be allowed to use these recordings for commercial purposes

f. The second party shall provide volunteer support for organizing disability awareness programs.

g. The second party shall organize time to time career guidance and employment programs including assistance for various competitive exams to Persons with disabilities (PwD's).

h. The second party shall try to cure and provide assistive devices to make the PWD PERSONS self-dependent, if any disability detected in any of college students.

i. The second party shall help for promoting and adapting of new and emerging sciences, technological innovations such as Artificial Intelligence (AI), Robotics and edge computing, etc.

IN WITNESS WHEREOF the parties hereto have set their respective hands on these presents on the day, month and year first written above in the presence of the following witnesses.

WITNNESSES:

AUTHORISED SIGNATORY
FIRST PARTY

1.

Prof. Narendra Singh
Zakir Husain Delhi College

2.

AUTHORISED SIGNATORY
SECOND PARTY

Sh. Tribhuvan Singh Rawat
State Sr. Vice President
Saksham Inderprastha

ZAKIR HUSAIN DELHI COLLEGE
(UNIVERSITY OF DELHI)
Jawaharlal Nehru Marg, New Delhi - 110002
Tel.: 011-23232218, 23232219, 23233420, Fax : 011-23215906
Website:www.zakirhusaindelhicollege.ac.in
email:zakirhusaindelhicollege@gmail.com

ज़ाकिर हुसैन दिल्ली कॉलेज
(दिल्ली विश्वविद्यालय)
जवाहरलाल नेहरू मार्ग, नई दिल्ली - 110002
दूरभाष: 011-23232218, 23232219, 23233420, फैक्स: 011-23215906
वेब स्थल: www.zakirhusaindelhicollege.ac.in
इ-मेल: zakirhusaindelhicollege@gmail.com

Accredited Grade 'A' by NAAC

ZHC:PO:116: *June 30, 2022*

M/s. ATTERO Recyling Pvt. Ltd.
Green Park
DEHRADUN (UK)

Dear Sirs,

This has reference to your proposal for collaboration for E-waste collection from Zakir Husain Delhi College. I am pleased to inform you that we are ready to accept your proposal as per the terms and conditions mentioned in the above mentioned letter for a period of one year w.e.f. 1st July 2022 to 30th June 2023.

With regards,

Yours sincerely

(Prof. Narendra Singh)
Principal

Copy to : Dr. R.K. Wattal

ATTERO RECYCLING

Date: 16th May 2022

Principal

Zakir Husain Delhi College

Delhi India

Sub: Proposal for Collaboration for E-waste Collection.

Greetings from Attero,

We wish to introduce Attero, India's Largest E-waste & Li-Ion battery Recycling company with a state of art e-waste recycling plant based in Roorkee. We are the only authorized partner of East Delhi Municipal Corporation for Door Step E-waste collection.

Driven towards responsibility for a sustainable tomorrow, **Clean e-India is our integrated consumer take-back program for the organized collection, management, and recycling of e-waste in a sustainable manner.**

The initiative is being done across major cities in the country, which are one of the primary sources of electronic waste generation.

We would like to Organize E-waste Awareness Program/Educational workshops at your esteemed college targeting college students in an effort to draw awareness to the environmental and human health impacts of electronic waste (E-Waste) disposal in the community. We have organized many E-waste collection drives in colleges and institutions such as Queen's valley College, Maharaja Agrasen Institute, Khalsa College.

Terms and Conditions as given below.

- Attero will provide a short video of our plant functioning and recycling process
- Attero will provide our "Clean E-India "program pamphlet to the students Including information on the impacts of E-waste on our health and environment
- Attero has a branded vehicle, Mentioning Details Such as our Toll-Free No (1800-102-98820) for Door Step collection of E-waste. Attero can use this vehicle on college premises for Awareness and for collection.
- Attero may ask Students to participate in this drive and bring E-waste from their homes to dispose of in an Eco-friendly manner by giving it to "ATTERO".

ATTERO RECYCLING

- Attero will provide a Recycling Certificate of "E-Waste Collection Drive "in the Name of College.
- Attero Will pay the amount at Rs 10/Kg rate.
- Attero will transfer online payment against E-waste collection done from college
- Attero Will use the pictures and name of the college as our partner and Collection drive images on social media platforms to promote such types of events.

We look forward to hearing from you to take it forward.

About E-waste

Today e-Waste is becoming a major menace to the environment and society as a whole.

Faster up-gradation of electronic products is forcing consumers to discard old electronic products very quickly, which, in turn, adds e-waste to the solid waste stream. The growing problem of e-waste calls for greater emphasis on recycling e-waste and better e-waste management.

About Attero

A NASA recognized technology innovator, Attero is India's largest electronic asset management company and an E-waste PRO. As a pioneer in the electronic waste management sector, Attero has been spearheading efforts to tackle the E-waste issue through its 360-degree approach. Powered by disruptive clean technology, Attero is the only Indian company, and one among seven globally, with the capability to extract valuable resources from E-waste in an eco-friendly manner. In line with the vision of our Honourable Prime Minister regarding Atam Nirbhar Bharat, we are aligned to develop India as a leader in the circular economy. Visit www.attero.in or Toll-Free Number (1800-102-9882) for more inquiries.

Thanks & Regards

ATTERO Recycling Pvt. Ltd.

Attero Recycling Pvt. Ltd.

ZAKIR HUSAIN DELHI COLLEGE
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Thanks & Regards

ATTERO Recycling Pvt. Ltd.

Attero Recycling Pvt. Ltd.

ATTERO RECYCLING {it's not waste, until it's wasted}

An EMS ISO 14001:2004 & OHSAS 18001:2007 company

Date 24-August-2022

Invoice .....

Reference no: 81

UEPPCB/HO/E-Waste/A-1/2021/94

Reg.....

This is to certify that **ATTERO RECYCLING** *has picked*

40 Kgs of Electronic Equipment Collected

from

Zakir Husain Delhi College (University of Delhi)

Jawaharlal Nehru Marg, New Delhi- 110002

All the material has been processed in an environment friendly manner, in accordance with the guidelines set by the authorised agency at our facility in Roorkee.

By Processing obsolete equipment, we are doing our duty to help keep our environment clean.

Attero Recycling

173, Village Bhagwanpur, Raipur Industrial Area,
Roorkee - 247661, Uttarakhand

Rohan Gupta
Chief Operating Officer, Attero Recycling

.....

E-Waste Collection Workshop

24th August, 2022

ARANYA, The Nature and Environment Society of Zakir Husain Delhi College, University of Delhi, organised an E-waste workshop under the aegis of IQAC in collaboration with ATTERO, on August 24th, 2022. Prior to this event, an E-waste collection drive was held on college grounds from August 10th to August 23rd.

The hosts for the event were Manav Aggarwal and Rishabh Yadav. The ceremony began with the lighting of the lamps by our distinguished guests, Mr. Shiv and Mr. Akash from Attero, our principal, Prof. Narendra Singh, Prof. P.K. Shishodia, IQAC Convenor, and Dr. Ratnum Kaul Wattal, Aranya Convenor. Prof. P.K. Shishodia and the Principal presented a souvenir to the guests.

Mr. Shiv took the floor to talk about the importance of e-waste recycling and the hazardous impacts of improper and careless disposal of e-waste. The speaker emphasised that E-Waste contains several precious metals, and that to recover them, they are frequently burnt in the open in an irresponsible manner, ignoring the fact that many toxic metals are also present in that E-Waste. Attero ensures proper disposal of all kinds of e-waste under proper scientific and controlled settings. They look at e-waste as an important resource that can be made useful instead of shunning it as a social and environmental burden. Attero is currently operating in 7 cities across the country.

World Rivers Day

16th September, 2022

ARANYA, the Nature and Environment Society of Zakir Husain Delhi College organized an event on the occasion of World Rivers Day on 16th September, 2022. The event commenced with a warm welcome of, the society's convener, Dr. Ratnum Kaul Wattal and the event's 3 judges. This was followed by Preeti Mathpal, Aranya's Vice president, providing information about our country's rivers and the need to conserve the same. The event was taken forward by Sonal and Utkarsh.

Three exciting events were planned for the students, 'What if' - A situation based narration, Poster Making competition and Meme Making competition. The theme of the poster making competition was - 'Jal Hai Toh Kal Hai'. Students participated enthusiastically and everyone was excited to show their creativity through their posters. There were 3 judges for the poster making competition. The main idea behind 'What if' was to provide the students with an opportunity to talk about environmental issues by adopting any of their favorite character's dialogues, behaviour, thoughts etc. All the students were confident while enacting their respective characters.

The program ended on a great note with a message from the society's convener, Dr. Kaul, for all the students. The judges also enjoyed the program thoroughly. Overall, the event was a great success!

EXPLORING THE EXTREMES

03rd November, 2022

Exploring Antarctica by the first Indian student who travelled there.
ARANYA- The Nature and Environment society, in collaboration with NARGIS- The Botanical Society of Zakir Husain Delhi College, organized a lecture on "Exploring the Extremes: Journey of a Botanist" on 3rd November 2022. The lecture was delivered by Prof. Dinabandhu Sahoo. He is the first Indian student to explore Antarctica during 1987-88. He is a senior professor in the Department of Botany at Delhi University and Director at the Centre for Himalayan Studies.
Prof. Dinabandhu took to the podium to narrate his life stories and the challenges he faced while exploring the regions of Antarctica and North East with witty anecdotes and humour. He talked about his academic journey and the difficulties he faced due to the lack of academic counselling and guidance in his time.

In his 25-day journey to Antarctica, he explained the physical challenges like nausea, seasickness, hydration issues, blizzards and frostbites, tough exploration for samples, and emotional challenges like loneliness.
Their journey had two objectives, setting the first permanent station of India and exploring in order to aid scientific research. He is one of the members who built the Maitreyi station at a very strategic location near Indra Priyadarshini Lake. He has also published a book, "I Have a Dream", narrating his story.
He has also explored the seven North Eastern states of India, researching and studying fermented food, cherry blossom trees, and orchid plantation. Furthermore, he has worked towards Women Empowerment by providing jobs to women in seaweed cultivation. He also initiated the only Cherry Blossom Festival in Meghalaya in 2015, which is now held annually in November.
Always aiming to do something unique, **Prof. Sahoo** is the epitome of relentless determination

@aranya.zhdc

srishti ENTRIES

23rd September 2022

INDUCTION DRIVE: 2022-23

12th December, 2022

INTERNSHALA
internships that matter

internshala.com
+91 124 4367427
+91 124 4004123
university.relations@internshala.com

Scholiverse Educare Pvt. Ltd.
B-610, Unitech Business Zone,
Gurgaon, Haryana – 122018
CIN: U80901HR2011PTC064443

INTERNSHALA COLLEGE REGISTRATION AGREEMENT

This Agreement is executed on 03-02-2023 by and between:

Scholiverse Educare Private Limited, having its registered office at B-610, Unitech Business Zone, Nirvana Country, Sector-50, Haryana - 122018, acting through its authorized representative Ms. Aayushi Sharma, Head, University Relations (hereinafter referred to as **"Internshala"**);

AND

Zakir Husain Delhi College (University of Delhi) (hereinafter referred to as the "**College**" which expression shall, unless repugnant to the meaning or context thereof, be deemed to include its executors, representatives and permitted assigns) of the other Party; acting through its authorized representative Prof. Narendra Singh, Principal.

Internshala and College may be referred to as 'Party' individually and as 'Parties' collectively, as the context may require.

Overview:
This agreement is regarding the college registration of 'Zakir Husain Delhi College (University of Delhi)' with 'Internshala'.

Responsibilities of Internshala:

- Create student accounts for all the students registered by the College.
- Provide weekly internship update to all the students registered by the College as per their filled in preferences
- Provide an online resume maker to all the students of the College registered with Internshala.
- Safeguard students' data as per Internshala privacy policy (https://internshala.com/privacy)
- Inform the college when students get selected for an internship.
- Provide College with Internshala logo and brand name to be used in College's communications (internal or external) and on its website to recognize Internshala as the internship and training partner and any other purpose limited to the scope of the agreement.

Responsibilities of College:

- Recognize Internshala as the internship and training partner in all internal and external communications including on its website and in admission/media brochures.
- Send a communication to all the students and faculties regarding the association and direct/encourage students to verify their accounts.
- Provide the information of all the interested students of the College as required by Internshala for their registration. The information should contain the first name, last name, mobile number and the email address of all the students of the College.
- Regularly post a list of students selected for internships through Internshala every month on the college's notice board.
- Authorize Internshala to recognize college, using College logo and/or brand name, as a registered user in its communications (internal or external) and on Internshala platform only for the purpose limited to the scope of the agreement.

Commercials:
This is a non-commercial agreement whereas neither party is required to make any payment to other party for carrying out the responsibilities listed in this agreement.

Term and Termination:
This agreement will be operational and valid from 03-02-2023 and the initial tenure of the agreement is 1 (one) year. Upon completion of the tenure, the agreement can be renewed for another 1 year and so on with mutual consent of both parties.
Under normal circumstances, either party wanting to terminate the agreement can do so and it can be done on a mutually agreed upon date in a justified way with a notification given at least one month prior to termination date.

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Indemnity

The college understands and agrees that all the information provided on Internshala related to internships and trainings is provided on *as is* basis. It further agrees that while Internshala makes efforts to ensure the accuracy of the information supplied, it does not guarantee it and the college will choose to disseminate this information to its students solely at its discretion. The college agrees to defend, indemnify and hold harmless Internshala, its subsidiaries, affiliates, licensors, employees, agents, third party information providers and independent contractors against any loss, claims, damages, costs, liabilities and expenses (including, but not limited to, reasonable attorneys' fees) arising out of or related to its use of content of Internshala platform feed that it posts, stores or otherwise transmits on or through its platform(s) or to its students or to general public at large.

The college understands and agrees that as a platform, Internshala acts as a bridge between the organizations who wish to hire interns and the students who wish to apply for the internships. We make best efforts to bring the best internships on the platform, educate students about the same and ensure that they can apply to these internships in a seamless manner. However, the eventual hiring decision, rightfully, resides with the organization which is hiring interns and is dependent on several factors such as the skills of the applicant, quality of her applications, competition, requirements and assessment process of the organization, student's availability at the required location and for the desired period of the internship etc. Since these factors are beyond Internshala's control, Internshala does not and can not guarantee an internship to an applicant.

The college further agrees to indemnify and hold harmless Internshala, its subsidiaries, affiliates, licensors, employees, agents, third party information providers and independent contractors, if any, who controls any thereof, against any loss, liability, claim, damage and expense whatsoever (including, but not limited to, any and all expenses whatsoever reasonably incurred in investigating, preparing or defending against any litigation commenced or threatened or any claim whatsoever) arising out of or based upon any false representation or warranty or breach or failure by the College to comply with any covenant or agreement made by the College herein or in any other document furnished by the College to any of the foregoing in connection with this agreement.

Trademarks:

Except to the limited extent expressly provided in this Agreement, neither Party grants, nor the other Party will not acquire any right, title or interest (including, without limitation, any implied license) in or to any property of the first Party. All rights not expressly granted herein are deemed withheld. All use by a Party of the other trade names, trademarks, service marks, logos, etc., and any goodwill associated therewith, will inure to the benefit of the grantor.

Confidentiality:

Internshala and the College will not disclose the details of this agreement and any private information that they come across when this agreement is in effect to any third-party.

If either Party (the "Receiving Party") under this Agreement gains access to confidential information of the other Party (the "Disclosing Party") concerning the Disclosing Party's prices, business, plans, technology, products, and other non-public information of the Disclosing Party (collectively, "CI" or "Confidential Information"), then the terms of this section will apply. CI includes all information in tangible or intangible form that is marked or designated as confidential by the Disclosing Party or that, under the circumstances of its disclosure, should be considered confidential. The Disclosing Party owns all right, title and interest, including all patent, copyright, trademark, trade secret rights and any other intellectual property or proprietary rights in any jurisdiction, including any and all applications, renewals, extensions and restorations thereof, in the Disclosing Party's CI. Each Party agrees that it will not use in any way, for its own benefit or the benefit of any third party, except as expressly permitted by, or as required to implement, this Agreement, nor disclose to any third party (except as required by law or to such Party's attorneys, accountants and other advisors as reasonably necessary), any of the Disclosing Party's CI. Each Party will take reasonable precautions to protect the confidentiality of the other Party's CI that are at least as stringent as it takes to protect its own CI.

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Force Majeure:
Except for any payment obligations, neither Party will be liable to the other for failure to fulfill obligations hereunder if such failure is due to causes beyond its control, including, without limitation, acts of God, earthquake, fire, flood, embargo, catastrophe, sabotage, utility or transmission failures, governmental prohibitions or regulations, national emergencies, insurrections, riots or wars, strikes, work stoppages or other labor difficulties ("Force Majeure Event"). The time for any performance required hereunder will be extended by the delay incurred as a result of such Force Majeure Event.

Disputes:
The Parties shall attempt in good faith to resolve any dispute arising out of or relating to this Agreement promptly by negotiation between executives.

Signed and Delivered by The Signatory Representative of Parties to this agreement:

For and on behalf of

Internshala

Scholiverse Educare Pvt. Ltd. Gurgaon

:_____

(Aayushi Sharma, Head - University Relations)

(Authorized Signatory)

Zakir Husain Delhi College (University of Delhi)

:_____

(Prof. Narendra Singh, Principal)

(Authorized Signatory)

प्राचार्य/Principal
जाकिर हुसैन दिल्ली महाविद्यालय
Zakir Husain Delhi College
दिल्ली विश्वविद्यालय/University of Delhi
नई दिल्ली-११०००२/New Delhi-110002

School of Open Learning
(Campus of Open Learning)
University of Delhi

No. SOL / PU/20/198 **Date** 24/2/202

The Principal,
Zakir Hussain College (M),
Ajmeri Gate,
New Delhi-110002

Sub: **Conduct of Academic Counselling Sessions of B.A. (Programme)/B.Com Semester-II on Saturdays of March, 2020 (07, 14, 21 & 28)**

Sir,

I take this opportunity to express my gratitude to you for kind support and co-operation in conducting Academic Counselling Sessions of SOL Under-graduate Courses for the Academic Session 2019-2020 at your esteemed Faculty/College.

It is well aware that the SOL had implemented CBCS (LOCF) Semester System in all undergraduate courses from the Academic Session 2019-2020 and onwards. Accordingly, the Academic Counselling Sessions for Semester-II for one of the courses are being conducted at your Study Centre.

As the SOL started the Academic Counselling Sessions of Semester-II in the first week of February, 2020 hence SOL will be required to conduct some more Academic Counselling Sessions of Semester-II at your Study Centre by the end of March-2020.

In the light of the above and bearing the best interest of the students in mind, you are requested kindly to make necessary arrangements for conducting Academic Counselling Sessions for Semester-II on 07th, 14th, 21st, & 28th March-2020 (Saturdays) also at your Study Centre, so that the SOL students may be able to get their study related doubts dispelled during these extended Academic Counselling Sessions.

Thanking you,

Yours faithfully,

(Dr. U. S. Pandey)
Dy. Director/OSD

S.O. Admn

28.2.2020

Principal's Office,
Receipt No. 689
Date 28-02-2020
Zakir Hussain Delhi College

5, Cavalry Lane, University of Delhi, Delhi-110007
Tel. : 27667600, 27667166, 27667645, Fax : 27667242

SCHOOL OF OPEN LEARNING
UNIVERSITY OF DELHI
5, CAVALRY LINES
DELHI-110007

Ph.No. 27008428, 27667600
27667645, 27667581

Ref. No.PCP/2022/ 218

Principal's Office,
Receipt No. 1127
Date 08-04-2022

Dated 30/3/2022

The Principal
Zakir Hussain College
J.L.Nehru Marg
Delhi- 110002

Sub: **Proposal for Establishment of Learner Support Centre for conducting Academic Counselling Sessions (PCP classes) for SOL Students.**

Sir/Madam,

I may like to submit that School of Open Learning, University of Delhi, is constituent institution of the University of Delhi which imparts quality higher education in distance mode in five under-graduate and five post-graduate courses for about 5 lakh students. To provide better students support services to SOL students, the Governing Body of School of Open Learning in its meeting held on 04th March, 2022 approved the revised guidelines for establishment of SOL Learner Support Centres and Regional Centres. It will be implemented from the academic session 2022-23 onwards.

Accordingly, SOL would like to establish a Learner Support Centre for the students of the SOL in your esteemed Faculty/College/Department. For this purpose some academic, administrative and logistic support would be required from the Faculty/College/Department for conducting Academic Counselling Sessions (PCP classes) smoothly during Saturdays, Sundays & Holidays, and conducting examinations, **if required,** as per the guidelines issued by the University/SOL from time to time. The comprehensive requirements as well as financial implications are given in the enclosed Proposal (Annexure 1).

The admission process for fresh students is likely to commence from April-May 2022 for undergraduate courses for the Session 2022-23 and consequent upon the Academic Counselling Sessions will probably be conducted for the students at Learner Support Centres in the month of April/May 2022 onwards.

I will be grateful to you, if you kindly give your consent to establish a Learner Support Centre in your Faculty/College/Department premises to facilitate Academic Counselling Sessions for the SOL Students and also conduct of examinations, **if required,** as per the guidelines issued by the University of Delhi/SOL from time to time.

The Proposal for the Establishment of SOL Learner Support Centre and guidelines are enclosed alongwith specimen of undertaking to be submitted by the Academic Coordinator on the stamp paper of Rs.100/- for your kind information and necessary compliance.

Thanking you,

Yours faithfully,

Principal (Officiating)

Encls: **As above.**

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INDIA NON JUDICIAL

सत्यमेव जयते

Government of National Capital Territory of Delhi

e-Stamp

Certificate No.	:	IN-DL56427114392513V
Certificate Issued Date	:	02-Feb-2023 03:06 PM
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Unique Doc. Reference	:	SUBIN-DLDL75410385985640930630V
Purchased by	:	DR NARENDER SINGH
Description of Document	:	Article 4 Affidavit
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	DR NARENDER SINGH
Second Party	:	Not Applicable
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Stamp Duty Amount(Rs.)	:	10 (Ten only)

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MEMORANDUM OF UNDERSTANDING
AMONGST
UNIVERSITY OF DELHI, Delhi - 110007
AND
SCHOOL OF OPEN LEARNING, (Campus of Open Learning)
5 Cavalry Lines, University of Delhi, Delhi – 110007
AND
Bhaorao Deoras Sewa Nyas, C – 91, Nirala Nagar, Lucknow – 226020 (U.P)
AND
Zakir Husain Delhi College, Jawahar Lal Nehru Marg, New Delhi-110002.

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Hereinafter collectively referred to as the "Parties" or individually as the "Party"

AND WHEREAS, all parties have agreed for collaboration to work together in the area of Skill Development, Employment and Entrepreneurship Development for the benefit of students of the University of Delhi & its colleges on the following terms and conditions:

1. UNIVERSITY OF DELHI

1.1 The party of the first part is offering various undergraduate and postgraduate degree programmes in its colleges and departments.

2. SCHOOL OF OPEN LEARNING

2.1 The party of the second part offers several courses/ programmes through open and distance learning mode to lakhs of students making education accessible.

3. BHAORAO DEORAS SEWA NYAS

3.1 The party of the third part BDSN through its project SAMARTH BHARAT is engaged in expanding skill development efforts in India by creating an end-to-end, outcome-focused implementation framework, which aligns the demands of the employers for a well-trained, skilled workforce with the aspirations of Indian citizens for sustainable livelihoods.

3.2 SAMARTH BHARAT also endeavours to nurture the entrepreneurs virtually and physically from the ideation till establishing of business Enterprise by providing single window support to the First Generation entrepreneurs or Educated Youth by a step-by-step roadmap for establishing a business enterprise or becoming an industry ready person.

3.3 SAMARTH BHARAT works for enhancing youth behavioural & professional competencies to make them industry ready through various interventions like regular live workshops, seminars, industrial documentaries, skilling, professional & experts episodes on the portal.

3.4 SAMARTH BHARAT provides end-to-end implementation framework for skill development, which provides opportunities for life-long learning and for quality long/short-term skill training that meets the aspirations of trainees as well as outcome focused training that aligns to employer/industry demand and workforce productivity with trainees' for sustainable livelihoods.

3.5 SAMARTH BHARAT focuses to build capacity for skill development in organized and un-organized sectors and provide pathways for re-skilling/up-skilling in pre-identified sectors, to enable them to

f) Create a Start-up support ecosystem in colleges with guidance for Idea and Start-up Launch, Incubation Centre Connect, Pitch development, Investor Tie-ups, etc.

g) Launch peer to peer mentorship program through various mediations like Entrepreneur Talks, Young Achievers Success Stories, Industry & Alumni Connect, etc.

6.3 As and when required, SAMARTH BHARAT shall provide its extensive network to support above mentioned initiatives like connecting with other educational, training institutions, business and industrial bodies, content development, experts network and services.

7. ALL PARTIES

7.1 Draw the attention of the top management in case of any interface or operational problems.

7.2 Will complete the project activities within the agreed time frames of the projects/programs that are initiated and developed.

7.3 Will work towards obtaining necessary ethical, legal, financial, administrative, and other required approvals/ permissions/ acceptance/ sanctions etc., required for joint activities at respective institution as well as from regulatory authority.

7.4 Shall ensure that all activities are conducted while meeting the highest standards of safety and regulations as per prevailing.

7.5 Shall ensure that all the data/information provided by any of the Parties should be used only for the purpose explicitly stated in the specific projects or which ethical/legal clearances are granted by the UNIVERSITY OF DELHI.

7.6 All the knowledge that is generated as a result of joint projects/activities shall be shared by all the parties.

7.7 All attempts will be made to ensure that developments and projects are accomplished to a very high degree of quality, with efficiency of time. All parties shall especially ensure that each party shall complete its tasks correctly in time where work of other party is dependent upon timely and correct completion of its work.

7.8 Not use/ sell/ license/ rent technologies/ resources/ material/ solutions of either parties to/for any third party without prior written mutual consent of the other party.

7.9 Undertake Projects in various areas of mutual interest on mutually agreed terms reduced into writing and signed by all the parties.

11. TERMINATION

11.1 This Memorandum of Understanding can be terminated at any time by any part with or without assigning any reason, by giving six month's written notice to all the other parties.

11.2 Upon termination of this MoU, each party shall return to the other such material, documents etc. belonging to the other parties lying in its possession.

12. SEVERABILITY

12.1 If any party of this MoU is found by a court of competent jurisdiction or other Competent Authority invalid, unlawful, or unenforceable, then such part will be severed from the remainder of this MoU which will continue to be valid and enforceable to the fullest extent permitted by any law.

13. FORCE MAJEURE

13.1 Neither party shall be liable to the other party for any delay or failure on their part in performing any of their obligation under this MoU, resulting from any cause beyond their control, but not limited to strike/ lock-outs, fires, floods, earthquake, explosions, war, enemy action, or political changes, natural disaster or military hostilities and strike of employees, the act or omission of any third party for whom the parties are not responsible.

13.2 Each of the parties agrees to give notice immediately to the other party upon becoming aware of an event of force majeure and such notice should contain details of the circumstances giving rise to it.

13.3 If a default due to force majeure continues for more than 6 weeks then the party not in default shall be entitled to terminate this agreement.

13.4 Neither party shall have any liability to the other in respect of the termination of this agreement as a result of force majeure.

14. LIMITATION OF LIABLITY:

14.1 In no event any of the parties be liable to the other party for any incidental, consequential, special and exemplary or direct or indirect damages, or for any lost profits, lost revenues, or loss business arising out of the subject matter of this MoU, regardless of the cause of action, even if the party has been advised of the likelihood of damages if the same is without intention and beyond reasonable control

20. NON-WAIVER

20.1 The failure or neglect by any of the Parties to enforce any of terms of this MOU shall not be construed as waiver of its rights preventing subsequent enforcement of such provisions or recovery of damages for breach thereof.

21. SIGNED IN DUPLICATE

21.1 This MoU is executed in quadruple with each copy being an official version of the agreement and having equal legal validity and supersedes all prior oral and written agreements, understandings, representations, conditions and all other communications relating thereto. Both copies together will constitute binding contract.

IN WITNESS WHEREOF, THE DULY AUTHORIZED REPRESENTATIVES OF THE PARTIES SIGNED THIS MEMORANDUM OF UNDERSTANDING AT THE PLACE AND ON THE DAY WRITTEN BELOW

(Dr. Vikas Gupta)
Registrar
University of Delhi
डॉ. विकास गुप्ता/Dr. VIKAS GUPTA
कुलसचिव/Registrar
दिल्ली विश्वविद्यालय/University of Delhi
दिल्ली–110 007/Delhi-110007

(Prof. Payal Mago)
Chairperson
School of Open Learning

(Shri Rahul Singh)
General Secretary
SAMARTH BHARAT – BDSN

(Prof. Narendra Singh)
Principal
Zakir Husain Delhi College

THE SEAL OF NOTARY PUBLIC
M. L. GARG
App. By
Govt. of NCT
of Delhi India
Regd. No. 058/08
DELHI

ATTESTED
Notary Public, Delhi
- 2 FEB 2023

15. GOVERNING LAW & JURISDICTION

15.1 All disputes regarding this MoU shall be under the jurisdiction of the Civil Courts of Delhi only.

15.2 This MoU shall be governed and interpreted in accordance with the established Law. Court of New Delhi shall have exclusively jurisdiction to try, entertain, and decide the matters, which are not covered under the Civil Courts.

16. COMMUNICATION

16.1 Each party shall nominate its Nodal Person who shall be the single point of authority for the purpose of implementation of this MoU.

16.2 Each Party is free to change or reappoint such contact point on its behalf with a notice to the other Party.

16.3 Each party may change nodal contacts/ address by written notice in accordance with this paragraph.

17. NOTICES

17.1 Any Notice, request, demand, approval, consent or other communications provided or permitted hereunder shall be in writing in Hindi/English Language and given by personal delivery or sent by registered post or by fax/email addressed to the above nodal contacts.

17.2 Notices delivered personally will be deemed communicated as of actual receipt. Mailed notices will be deemed communicated as of four (4) days after mailing.

17.3 Post-mailed notices will be deemed communicated as of seven (7) days after mailing.

18. MODIFICATION

18.1 No modification to this MoU, will be effective unless agreed to in writing by all the parties and duly signed by the authorised signatories of the Parties.

19. HEADING

19.1 The headings shall not limit, alter or affect the meaning of the Clauses headed by them and are solely for the purpose of easy reference.

7.10 Ensure the safety of the personnel and material whenever placed at all ends by the all the parties.

8. CONFIDENTIALITY, COPYRIGHT AND INTELLCTUAL PROPERTY RIGHTS

8.1 Existing IP as on date of execution of this MoU shall be exclusively owned by respective parties to which the IP belongs.

8.2 All the parties shall be ensured that all the data/information provided by either party will be used in accordance with the regulations and guidelines on human ethics and privacy of personal data law and also strictly in accordance with the Indian Intellectual Property Laws and Rules.

8.3 The intellectual property (including but not limited to inventions, ideas, innovations know-how/ process/ design/ technique/ copyright/patent etc.,) generated / created / designed / developed in relation to or arising out of or incidental to any projects initiated under this MoU shall be owned jointly by all the parties.

8.4 All the parties agree to hold in confidence all data/information designated by either party as being confidential which is obtained from either party or created during the operation of this MoU and shall not be disclosed to any outsider without written consent of all parties.

8.5 For any intellectual property arising during the operation of this MoU, respective Participating Institutions intend to ensure adequate and effective protection of the same in order to maintain its uniqueness and shall never be shared with any outsider.

9. REVENUE SHARING

9.1 Bhaorao Deoras Seva Nyas through its project SAMARTH BHARAT provides a facilitating platform for skill development, jobs and business start-up to the needy people without charging any fees.

9.2 UNIVERSITY OF DELHI, SOL & Zakir Husain Delhi College shall provide resources required to support their students like training infrastructure, remuneration directly to trainers, staff for management of Career Development Centre, etc.

10. COMMENCEMENT AND DURATION

10.1 This MoU shall be effective from the date of signature by the Heads of all the parties and/or their nominees. This MoU will be valid for 05 Years (Five Years) from the date of its commencement.

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transit into formal sector employment through a developed network of quality instructors thereby we will establish this ecosystem through high-quality teacher training institutions and leveraging existing public infrastructure and industry facilities.

4. The party of the fourth part is a constituent college of the University of Delhi offering various undergraduate and postgraduate degree programmes.

5. SCOPE OF THE MOU

This MOU is only to facilitate collaboration to work together in the area of Career Counselling, Skill Development, Employment, Entrepreneurship Development, Start-up support and Mentorship Program for the benefit of students of UNIVERSITY OF DELHI, Delhi without any financial implications from either of the parties.

6. ROLE AND RESPONSIBILITIES

6.1 All parties will work together to create a career development framework and implement it through a Career Development Centre based in the premises of the FOURTH PART.

6.2 All parties shall appoint respective Single point of contact (SPOC) that will work together to identify/develop and implement various career development offers including but not limited to

a) Inspiring students to take self-development as a lifelong habit. The same shall be achieved through creation of Career Development Centre, Community, Career Support Helpline, University of Delhi, SOL, Samarth Bharat & Zakir Husain Delhi College Website, Support Groups, etc.

b) Implement career counselling framework to identify competency, interest and prospective career paths including exposure to various career options with guidance to choose the right career path & skilling/educational requirements.

c) Creating college based or external training infrastructure (E-Learning/ Classroom/ Internships) for various trainings like – Employability Skills & Workplaces issues, Finance Management & Investing, Competency Development, Vocational Skills, etc.

d) Organise various job placement opportunities including – Domestic & Global Work Opportunities (Technical Intern Training Program, Etc.), Earn while u learn – part time jobs & Internships, etc.

e) Organise various interventions for Entrepreneurship Development Program including exposure to industrial sector wise business opportunities, training in industry, business start training including guidance on how to organise finance for projects, etc.

THIS MEMORANDUM OF UNDERSTANDING (hereinafter referred to as "MoU") is made and executed on 07th February, 2023 at Delhi.

By and among

UNIVERSITY OF DELHI, Established in 1922 as a unitary, teaching and residential University incorporated under The Delhi University Act, 1922 as amended from time to time comprising of 16 faculties, 86 departments and 91 colleges (herein after referred to as "UNIVERSITY OF DELHI", which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, executors, successors or administrators and permitted assigns), represented by its Registrar, Dr. Vikas Gupta.

Party of the First PART

AND

The School of Open Learning (Herein after referred to as SOL) a part of the Campus of Open Learning formerly known as the School of Correspondence Courses and Continuing Education, established under the University of Delhi in 1962, is a pioneer Institution in the field of Distance Education in India, represented by its Chairperson, School of Open Learning, Prof. Payal Mago.

Party of the Second PART

AND

Bhaorao Deoras Seva Nyas is a Non-Profit Charitable Trust (under Section 12AA) registered in 1993 having its registered office at C-91, Nirala Nagar, Lucknow, Uttar Pradesh - 226020 (hereinafter referred to as "BDSN", which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, executors, successors or administrators and permitted assigns) represented by its General Secretary, Shri Rahul Singh.

Party of the Third PART

AND

Zakir Husain Delhi College, is a constituent college of the University of Delhi and located at Jawahar Lal Nehru Marg, New Delhi-110002, India (herein after referred to as "Respective college, Delhi", which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, executors, successors or administrators and permitted assigns) represented by its Principal, Prof. Narendra Singh.

Party of the Fourth PART

Hired on	Student name	Stream
	Palak Shukla	NA
5/31/2023	Bhavya Gupta	Commerce With Maths
5/31/2023	Shreya Srivastava	Science
5/31/2023	Sadia Anjum	Arts
5/30/2023	AKHLAK AHMAD	History
5/30/2023	Tuhin Kashyap	Mathematics
5/29/2023	Varsha Katiyar	Psychology
5/27/2023	Geetanjali Gits	English
5/27/2023	Binish Sania	Commerce
5/27/2023	Gayatri	Art
5/26/2023	Garv Dubey	Political Science
5/26/2023	Garv Dubey	Political Science
5/26/2023	MANASVI VERMA	NA
5/26/2023	Samiksha Chaudhary	NA
5/24/2023	Prashant Sharma	Commerce With Maths
5/23/2023	Chaitanya	Physical Science
5/23/2023	Harsh Mathur	Humanities
5/22/2023	MUKUL SHARMA	NA
5/22/2023	Harshit	NA
5/20/2023	Gaurav Kumar	Mathematics
5/16/2023	Ashish Kumar	History
5/15/2023	MOHD ARSHAD	Political Science
5/14/2023	Manish Kumar	Commerce
5/12/2023	Devanshi Gupta	Commerce
5/12/2023	Dewashish Bhengra	NA
5/12/2023	Purva Chandak	NA
5/11/2023	Nandini Kashyap	Science
5/8/2023	Naina Rastogi	NA
5/6/2023	Manish Kumar	Commerce
5/6/2023	Saranga Kaushik	Marketing
5/5/2023	Vicky Jack	Arts
5/5/2023	Naman Dhamija	NA
5/4/2023	Deeksha Shakya	NA
5/4/2023	Deeksha Shakya	NA
5/4/2023	Naina Rastogi	NA
5/1/2023	Mohammad Abdullah	Commerce
4/30/2023	Mohammad Abdullah	Commerce
4/30/2023	Raheema Shirin V P	NA
4/29/2023	Siddharth Jha	HR
4/29/2023	Kunal Mittal	NA
4/26/2023	Sadia Anjum	Arts
4/22/2023	Poonam	Political Science
4/22/2023	JIYA MIGLANI	Economics
4/20/2023	Pranjali Singhal	Science
4/19/2023	Yashi Singh	Commerce
4/18/2023	Pranjali Singhal	Science
4/18/2023	Prachee Dash	Psychology
4/16/2023	Parul Prabhakar	Commerce
4/15/2023	Deepali Maurya	Commerce With Maths

4/15/2023	Gungun Yadav	Life Science
4/14/2023	Gungun Yadav	Life Science
4/14/2023	Ashok Choudhary	Economics With History
4/14/2023	Leena	Commerce
4/14/2023	Leena	Commerce
4/14/2023	Gungun Yadav	Life Science
4/13/2023	Suryansh Sharma	NA
4/12/2023	Ashok Choudhary	Economics With History
4/10/2023	Siddharth Jha	HR
4/8/2023	Siddharth Jha	HR
4/8/2023	Pranjali Singhal	Science
4/6/2023	Neha Pal	Commerce With Maths
4/5/2023	Shantanu Rajput	NA
4/5/2023	Saurav Singh	Economics
4/4/2023	Satyam Kumar	NA
4/4/2023	Aachal Agrawal	English
4/4/2023	Rashi Gaur	Commerce With Maths
4/4/2023	Adwaidh G Nair	NA
4/4/2023	Shantanu Rajput	NA
4/3/2023	Himanshu Singh	Arts
4/2/2023	Antra Yadav	Commerce
4/1/2023	Saumya Shukla	NA
3/30/2023	Saranga Kaushik	Marketing
3/30/2023	Ankit Singh	Chemistry
3/30/2023	Ayush Singhal	Commerce
3/29/2023	Varsha Katiyar	Psychology
3/29/2023	Khushi Kumari	Biology
3/28/2023	Mavia Faheem	English
3/28/2023	Krishank Chauhan	Economics
3/27/2023	Kritika Thakur	Humanities
3/27/2023	Taniya	NA
3/27/2023	Rimika Verma	NA
3/27/2023	Satyam Kumar	NA
3/27/2023	Arpita Pandey	History
3/22/2023	Sharik Nikki	English
3/21/2023	Akash Kumar	Commerce With Maths
3/21/2023	Ankit Singh	Chemistry
3/21/2023	Saranga Kaushik	Marketing
3/20/2023	Akash Kumar	Commerce With Maths
3/20/2023	Pranjali Singhal	Science
3/20/2023	Ayesha Khan	Political Science
3/20/2023	Ayush Singhal	Commerce
3/20/2023	Riya Talla	English
3/18/2023	Satyam Kumar	NA
3/15/2023	Ayush Singhal	Commerce
3/15/2023	Himanshi	Psychology
3/15/2023	Antony Paul Vazhappilly	Arts
3/14/2023	Khushi Kumari	Biology
3/14/2023	Ayush Singhal	Commerce
3/13/2023	Tushar Saini	NA

3/13/2023	Ankit Singh	Chemistry
3/13/2023	Alok Pandey	Economics
3/13/2023	Alqama Khan	Botany
3/13/2023	Ankit Singh	Chemistry
3/12/2023	Sinan Hussain	Political Science
3/11/2023	Ashok Choudhary	Economics With History
3/11/2023	Chaitanya	Physical Science
3/11/2023	Antony Paul Vazhappilly	Arts
3/11/2023	Ayush Singhal	Commerce
3/11/2023	Chaitanya	Physical Science
3/10/2023	Ankit Singh	Chemistry
3/10/2023	Chaitanya	Physical Science
3/10/2023	Chaitanya	Physical Science
3/8/2023	Jatin Bohat	NA
3/7/2023	Alaina Hassan	Commerce
3/5/2023	Abdullah Sheikh	Arts
3/3/2023	Parul Prabhakar	Commerce
3/3/2023	Mohd Faisal Khan	Electronics Engineering
3/3/2023	Sreya Mukundan	Psychology
3/2/2023	Bhavya Gupta	Commerce With Maths
3/2/2023	Gungun Yadav	Life Science
3/2/2023	Samir Khan	NA
3/2/2023	Rajneesh Maurya	Chemistry
3/2/2023	Maivish Naaz	Commerce With Maths
3/2/2023	Sreya Mukundan	Psychology
3/2/2023	Parul Prabhakar	Commerce
3/1/2023	Sachin Malik	NA
3/1/2023	Ritik Sankhwar	Economics
3/1/2023	Shubham Bhatt	NA
3/1/2023	Dev Sagar	Commerce
2/28/2023	Aarti Maurya	Arts
2/28/2023	Ayush Kumar	Economics
2/28/2023	Gungun Yadav	Life Science
2/28/2023	Rajneesh Maurya	Chemistry
2/27/2023	Khushi Kumari	Biology
2/27/2023	Khushi Kumari	Biology
2/27/2023	Rajneesh Maurya	Chemistry
2/27/2023	Khushi Kumari	Biology
2/27/2023	Rajneesh Maurya	Chemistry
2/27/2023	Yukta Mathur	Psychology
2/27/2023	Anas Ansari	Economics
2/25/2023	Samiksha Kashyap	Mathematics
2/24/2023	Saima Khan	NA
2/24/2023	Samrat Deb	Political Science
2/24/2023	Gungun Yadav	Life Science
2/23/2023	Mohini Kaushal	Political Science
2/23/2023	Parul Prabhakar	Commerce
2/23/2023	Gul Rukh	Economics
2/22/2023	Sachin Malik	NA
2/22/2023	Anisha Bhagat	Commerce

2/21/2023	Abdullah Sheikh	Arts
2/20/2023	Mavia Faheem	English
2/20/2023	Mudita Sehgal	Commerce
2/19/2023	Mavia Faheem	English
2/19/2023	Ritesh Rathor	Psychology
2/19/2023	Parul Prabhakar	Commerce
2/19/2023	Parul Prabhakar	Commerce
2/19/2023	Abdullah Sheikh	Arts
2/19/2023	Nibedita Paul	Psychology
2/19/2023	Sahil Malik	electronics
2/18/2023	Sazia Kamar	Economics
2/17/2023	Dev Sagar	Commerce
2/17/2023	Ayush Kumar	Economics
2/17/2023	Dev Sagar	Commerce
2/17/2023	Ayush Kumar	Economics
2/16/2023	Anamika Das	Psychology
2/15/2023	Nibedita Paul	Psychology
2/13/2023	Bhawna Singh	Biochemistry
2/13/2023	Saurav Singh	Economics
2/13/2023	Devansh Dixit	Economics And Political Science
2/13/2023	Waquar Ahmad	Arabic
2/13/2023	Briti Sen	NA
2/11/2023	Bhawna Singh	Biochemistry
2/11/2023	Swati Gupta	NA
2/11/2023	Bhawna Singh	Biochemistry
2/10/2023	Parth Tripathi	Chemistry
2/10/2023	Parth Tripathi	Chemistry
2/10/2023	Devansh Dixit	Economics And Political Science
2/10/2023	Jaza Ali	NA
2/8/2023	Parth Tripathi	Chemistry
2/8/2023	Kirti Nautiyal	Biological Science
2/8/2023	Alaina Hassan	Commerce
2/8/2023	Saurav Singh	Economics
2/7/2023	Nibedita Paul	Psychology
2/6/2023	Sudhanshu Kumar	English
2/6/2023	Mahak Sharma	Chemistry
2/5/2023	Deepali	Political Science
2/4/2023	Mahak Sharma	Chemistry
2/4/2023	Rupali Meena	English Honours
2/4/2023	Anamika Das	Psychology
2/4/2023	Bhawna Singh	Biochemistry
2/4/2023	Bhawna Singh	Biochemistry
2/4/2023	Bhawna Singh	Biochemistry
2/4/2023	Swati Gupta	NA
2/4/2023	Bhawna Singh	Biochemistry
2/4/2023	Bhawna Singh	Biochemistry
2/3/2023	Shantanu Rajput	NA
2/2/2023	Abhishek Singh	Chemistry
2/2/2023	Rishi Kaushal	Arts
2/2/2023	Mansi Sharma	Botany

2/2/2023	Rupali Meena	English Honours
2/1/2023	Nikhil Santhosh	Commerce
2/1/2023	Bhawna Singh	Biochemistry
1/31/2023	Abhishek Singh	Chemistry
1/31/2023	Rik Maji	Persian Literature
1/31/2023	Ashish	Physical Science With Chemistr
1/31/2023	Ritesh Rathor	Psychology
1/30/2023	Bhawna Singh	Biochemistry
1/30/2023	Arpita Pandey	History
1/29/2023	Alaina Hassan	Commerce
1/29/2023	Ashok Choudhary	Economics With History
1/27/2023	Harshit Verma	Mathematics
1/27/2023	Arvind Kumar Singh	Commerce
1/25/2023	Yash Tyagi	Political Science
1/25/2023	Sudhanshu Kumar	English
1/23/2023	MOHD ARSHAD	Political Science
1/23/2023	Abhishek Singh	Chemistry
1/23/2023	Nandana Anilkumar	Commerce With Maths
1/23/2023	MOHD ARSHAD	Political Science
1/20/2023	Nandana Anilkumar	Commerce With Maths
1/20/2023	Shaivya Nigam	History
1/20/2023	Saumya Dubey	History
1/20/2023	Rik Maji	Persian Literature
1/20/2023	Samir Ali	Science
1/20/2023	Nandana Anilkumar	Commerce With Maths
1/20/2023	Samir Ali	Science
1/19/2023	Shaivya Nigam	History
1/19/2023	Rik Maji	Persian Literature
1/19/2023	Samir Ali	Science
1/17/2023	Shaivya Nigam	History
1/16/2023	Aarti Maurya	Arts
1/16/2023	Shaivya Nigam	History
1/16/2023	Shaivya Nigam	History
1/15/2023	Shaivya Nigam	History
1/15/2023	Shaivya Nigam	History
1/14/2023	Ravi Shankar Singh	NA
1/14/2023	Rupali Meena	English Honours
1/13/2023	Ritesh Rathor	Psychology
1/13/2023	MOHD ARSHAD	Political Science
1/13/2023	Shaivya Nigam	History
1/11/2023	Shivam Mishra	NA
1/11/2023	Yash Gupta	NA
1/11/2023	Sara Nasreen	Economics
1/11/2023	Faraz Akhtar	NA
1/10/2023	MOHD ARSHAD	Political Science
1/10/2023	Adwaidh G Nair	NA
1/9/2023	Alaina Hassan	Commerce
1/8/2023	Kunal Mittal	NA
1/6/2023	Sakshi Tripathi	Commerce
1/5/2023	Alaina Hassan	Commerce

1/5/2023	Nibedita Paul	Psychology
1/5/2023	Shreya Singh	Science
1/5/2023	Nikhil Maurya	Commerce
1/4/2023	Rupali Meena	English Honours
1/4/2023	Tanvi Mahajan	Science
1/3/2023	Rachit Gilhotra	NA
1/2/2023	Geetanjali Gits	English
1/2/2023	Rawaan Ahmad	Commerce
1/2/2023	Saurav Singh	Economics
1/1/2023	Tamanna Dey	NA
12/30/2022	Kunal Mittal	NA
12/29/2022	AKHLAK AHMAD	History
12/28/2022	Anamika Das	Psychology
12/28/2022	Anamika Das	Psychology
12/28/2022	Prachee Dash	Psychology
12/27/2022	Samyak Jain	NA
12/26/2022	Avni Aggarwal	Chemistry
12/26/2022	AKHLAK AHMAD	History
12/26/2022	Mrittika Datta	Botany
12/25/2022	Tanmay Mishra	NA
12/24/2022	Kunal Mittal	NA
12/23/2022	AKHLAK AHMAD	History
12/20/2022	Aarti Khanna	Philosophy
12/18/2022	Avni Aggarwal	Chemistry
12/18/2022	Avni Aggarwal	Chemistry
12/18/2022	Sudarshan Rajput	NA
12/14/2022	Anamika Das	Psychology
12/14/2022	Himanshi	Psychology
12/10/2022	Deepak Kumar	Chemistry
12/10/2022	Rachit Gilhotra	NA
12/9/2022	Nibedita Paul	Psychology
12/8/2022	Mahvish Fatma	Commerce
12/7/2022	Himanshi Chauhan	Life Science
12/5/2022	Harsh Kumar	NA
12/5/2022	Deepak Kumar	Chemistry
12/4/2022	Briti Sen	NA
11/30/2022	Sara Nasreen	Economics
11/28/2022	Janhvi Singh	Mathematics
11/25/2022	Mudit Mathur	Political Science
11/24/2022	Abdul Qayyum	Sanskrit
11/24/2022	Abdul Qayyum	Sanskrit
11/23/2022	Aman Kumar	Hindi
11/22/2022	Nikhil Saneja	NA
11/21/2022	Faraz Akhtar	NA
11/19/2022	Himanshi	Psychology
11/19/2022	Nandita Nirwan	NA
11/19/2022	Mohammed Kaif Masoodi	URDU
11/19/2022	Mohammed Kaif Masoodi	URDU
11/16/2022	Manish Pal	Commerce
11/16/2022	MANASVI VERMA	NA

11/16/2022	Mohammed Kaif Masoodi	URDU
11/16/2022	Diya Chauhan	Political Science
11/14/2022	Gungun Yadav	Life Science
11/14/2022	Adeeba Abbas	Arts
11/14/2022	MANASVI VERMA	NA
11/14/2022	Adeeba Abbas	Arts
11/12/2022	Gooncha Chhibber	Zoology
11/12/2022	Ashok Choudhary	Economics With History
11/11/2022	Muhammed Nihal K	Commerce
11/10/2022	Muhammed Nihal K	Commerce
11/9/2022	Sumiti Kumari	Psychology
11/8/2022	Sumiti Kumari	Psychology
11/8/2022	Sumiti Kumari	Psychology
11/7/2022	Shayna	Chemistry
11/4/2022	Sahil Abbas Zaidi	NA
11/4/2022	Muhammed Nihal K	Commerce
11/3/2022	Saloni Sharma	Political Science
11/3/2022	Mohammed Rayyan	NA
11/1/2022	Vipin Pillai	Economics
10/31/2022	Muzammil Khan	Arts
10/29/2022	Rupsi Gujrati	NA
10/25/2022	Suryansh Sharma	NA
10/25/2022	Tehreem Khan	Humanities
10/19/2022	Swati Yadav	Physical Science
10/17/2022	Abdul Qayyum	Sanskrit
10/17/2022	Briti Sen	NA
10/17/2022	Anju Balyan	Botany
10/17/2022	Sakshi Tripathi	Commerce
10/16/2022	Kritika Thakur	Humanities
10/15/2022	Srishti Sharma	Humanities
10/15/2022	Bhagwan Prasad	Political Science
10/15/2022	Bhagwan Prasad	Political Science
10/15/2022	Bhagwan Prasad	Political Science
10/15/2022	Sakshi Tripathi	Commerce
10/14/2022	Mayank Jain	NA
10/14/2022	Sakshi Tripathi	Commerce
10/14/2022	Bhagwan Prasad	Political Science
10/14/2022	Sakshi Tripathi	Commerce
10/14/2022	Sakshi Tripathi	Commerce
10/13/2022	Bhagwan Prasad	Political Science
10/13/2022	Faiz Khan	Commerce With Maths
10/13/2022	Ritu	NA
10/13/2022	Mehak Chopra	NA
10/13/2022	Mohammed Kaif Masoodi	URDU
10/13/2022	MANASVI VERMA	NA
10/12/2022	Mayank Jain	NA
10/12/2022	Mohammed Kaif Masoodi	URDU
10/11/2022	Srishti Sharma	Humanities
10/10/2022	Devanshi Gupta	Commerce
10/9/2022	Swapnalishaa	NA

10/8/2022	Mehak Chopra	NA
10/7/2022	Samoon Mumtaz	Life Sciences
10/7/2022	Samoon Mumtaz	Life Sciences
10/7/2022	Mehak Chopra	NA
10/6/2022	Samoon Mumtaz	Life Sciences
10/6/2022	Faraz Akhtar	NA
10/6/2022	Faraz Akhtar	NA
10/6/2022	Srishti Sharma	Humanities
10/6/2022	Samoon Mumtaz	Life Sciences
10/4/2022	Satyam Ray	Political Science
10/4/2022	Satyam Ray	Political Science
10/3/2022	Satyam Ray	Political Science
10/3/2022	Satyam Ray	Political Science
10/1/2022	Faraz Akhtar	NA
10/1/2022	Saraswati	History & Sanskrit
10/1/2022	Rajkumari Lanchenbi	Life Science
10/1/2022	Zakiya Ahsan Mirza	Commerce
10/1/2022	Faraz Akhtar	NA
10/1/2022	Nihal Arora	Arts
10/1/2022	Satyam Ray	Political Science
10/1/2022	Yash Negi	NA
9/30/2022	DIVYA	Economics And Taxation
9/30/2022	Nibedita Paul	Psychology
9/29/2022	Mehak Chopra	NA
9/27/2022	Anshika Diwakar	Psychology
9/27/2022	Anshika Diwakar	Psychology
9/25/2022	Rupali Meena	English Honours
9/24/2022	Sanchita	Commerce
9/24/2022	Saurabh Kumar	Arts
9/24/2022	Anshika Diwakar	Psychology
9/23/2022	Anshika Diwakar	Psychology
9/23/2022	Mohammed Kaif Masoodi	URDU
9/23/2022	Mohammed Kaif Masoodi	URDU
9/21/2022	Mehak Chopra	NA
9/21/2022	Gunveen Anand	NA
9/20/2022	Ravi Shankar Singh	NA
9/19/2022	Samyak Jain	NA
9/19/2022	Anshika Diwakar	Psychology
9/19/2022	Samyak Jain	NA
9/17/2022	Mayank Jain	NA
9/17/2022	Mayank Jain	NA
9/16/2022	Deepali Maurya	Commerce With Maths
9/16/2022	Manavi Jain	Psychology
9/16/2022	Mayank Jain	NA
9/16/2022	Shruti Bansal	Zoology
9/15/2022	Sanskar Dhanuka	Psychology
9/14/2022	Deepali Maurya	Commerce With Maths
9/14/2022	Mayank Jain	NA
9/14/2022	Mohammed Kaif Masoodi	URDU
9/13/2022	DIVYA	Economics And Taxation

9/10/2022	Yash Negi	NA
9/10/2022	Mehak Chopra	NA
9/8/2022	Tanishq Choudhary	NA
9/8/2022	Aditi Madhur	Psychology
9/8/2022	Abhinav Katariya	Psychology
9/6/2022	Saraswati	History & Sanskrit
9/5/2022	Sanskar Dhanuka	Psychology
9/2/2022	Aryan Kumar	Humanities
8/29/2022	Anshul Agarwal	Psychology And Maths
8/26/2022	Kavya Khangarot	Psychology
8/26/2022	Jyotika Rai	Psychology
8/25/2022	Muhammed Safvan	Political Science And Arabic
8/25/2022	Sachi Aggarwal	Psychology
8/23/2022	MANASVI VERMA	NA
8/20/2022	Mehak Chopra	NA
8/20/2022	Gooncha Chhibber	Zoology
8/19/2022	Kanishka Mani	Political Science And Philosophy
8/19/2022	Ayesha Khan	Political Science
8/19/2022	Abhinn Gilotrra	Psychology And Human Resour
8/19/2022	Kavya Khangarot	Psychology
8/18/2022	Varun Narayanan	NA
8/16/2022	Dewashish Bhengra	NA
8/16/2022	Ansh Gupta	NA
8/16/2022	Janhvi Singh	Mathematics
8/16/2022	Kritika Thakur	Humanities
8/15/2022	Sazia Kamar	Economics
8/13/2022	Kritika Thakur	Humanities
8/13/2022	Saraswati	History & Sanskrit
8/12/2022	Sachi Aggarwal	Psychology
8/12/2022	Jyotika Rai	Psychology
8/9/2022	Gooncha Chhibber	Zoology
8/8/2022	Sazia Kamar	Economics
8/8/2022	Rupali Meena	English Honours
8/8/2022	Varun Narayanan	NA
8/4/2022	Ayesha Khan	Political Science
8/3/2022	Luthfiya Abrar	Political Science
8/3/2022	Dalisha Jung	Economics
8/2/2022	Varun Narayanan	NA
7/29/2022	Pratima Dwivedi	Philosophy
7/29/2022	Ayesha Khan	Political Science
7/29/2022	Muzammil Khan	Arts
7/27/2022	Dev Sagar	Commerce
7/26/2022	Ramsha Zaidi	Political Science
7/26/2022	Fidel George	NA
7/25/2022	Aachal Agrawal	English
7/22/2022	Kashish Gumber	Psychology
7/21/2022	Dolly Sah	Zoology
7/21/2022	Rupali Meena	English Honours
7/20/2022	Mohammed Kaif Masoodi	URDU
7/20/2022	Mohammed Kaif Masoodi	URDU

7/20/2022	Aman Aggarwal	NA
7/19/2022	Samiya Aziz	English
7/19/2022	Briti Sen	NA
7/18/2022	Nidhi Adlakha	NA
7/18/2022	Rupsi Gujrati	NA
7/17/2022	Aman Aggarwal	NA
7/17/2022	Upasana Rawat	Economics And Human Resourc
7/16/2022	Rupsi Gujrati	NA
7/15/2022	Mershalin Ekka	NA
7/15/2022	Mustafa Asad	Commerce
7/15/2022	Ansh Gupta	NA
7/14/2022	Saurabh Kumar	Commerce
7/14/2022	Briti Sen	NA
7/10/2022	Dishieta Batra	English
7/7/2022	Saurabh Kumar	Commerce
7/7/2022	Mohd Fuzail	Psychlogy
7/6/2022	Saurabh Kumar	Commerce
7/6/2022	Saurabh Kumar	Commerce
7/6/2022	Anubha Lohchab	English
7/5/2022	Raj Krishna	History
7/4/2022	Aleena Parveen	Commerce
7/4/2022	Rupali Meena	English Honours
7/4/2022	UMME KULSUM	Political Science
7/4/2022	Abhinav Katariya	Psychology
7/4/2022	Himanshi	Psychology
7/4/2022	Rupali Meena	English Honours
7/1/2022	Mohammed Kaif Masoodi	URDU

Graduation year	Company name	Stipend
2022	De Haath Society	Performance Based
2024	Ads Klick Media	₹1000-3000 /month
2024	NayePankh Foundation	₹5000-10000 lump sum
2009	Muskurahat Foundation	₹5000-10000 lump sum
2025	Zerobalance Technologies Private	Performance Based
2024	NayePankh Foundation	Performance Based
2020	CollabAdda	₹5000 /month
2021	Home Of Marketing	₹15000 /month
2019	Digitalatto	₹15000 /month
2021	Digitalatto	₹ 2,00,000 - 3,00,000 /year
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
NA	She Can Foundation	₹5000-10000 lump sum
2024	She Can Foundation	₹5000-10000 lump sum
2020	Gemtroves Advertising	₹5000 /month
2024	Muskurahat Foundation	₹5000-10000 lump sum
2023	Hamari Pahchan NGO	Performance Based
2025	Tare Zameen Foundation	₹1000 /month + Incentives
2025	Tare Zameen Foundation	₹1000 /month + Incentives
2023	Hamari Pahchan NGO	Performance Based
2022	Angel Broking	₹1000 /month + Incentives
2016	Hamari Pahchan NGO	Performance Based
2021	InAmigos Foundation	₹1000-4000 /week
2024	Dashtoon	₹10000 /month
2020	Marpu Foundation	Performance Based
2022	Sameer Mansoori	₹ 8,00,000 /year
2024	Hamari Pahchan NGO	Performance Based
2025	ICHARS Support Foundation	Performance Based
2021	InAmigos Foundation	₹1000-4000 /week
2025	Super One Intelligence Vidyarthi P	₹10000 /month
2019	Hamari Pahchan NGO	Performance Based
NA	Nadeem Ahmad	₹ 2,00,000 - 2,50,000 /year
NA	Team Everest	Performance Based
NA	Hamari Pahchan NGO	Performance Based
2025	NayePankh Foundation	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	NayePankh Foundation	Performance Based
2024	NayePankh Foundation	Performance Based
2026	InAmigos Foundation	₹1000-4000 /week
2024	ARKIT Incorporation	₹12000-15000 /month
2009	Support And Care Humanity Founc	₹500-2500 /week
2024	NayePankh Foundation	Performance Based
2025	Muskurahat Foundation	₹5000-10000 lump sum
2024	Jankalyan Multipurpose Education	Performance Based
2025	Support And Care Humanity Founc	₹500-2000 /week
2024	Kads Consultancy	₹2000 /month
2025	Hamari Pahchan NGO	Performance Based
2020	Chamela Helpdia Charitable Trust	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum

2024	A2Z Supermarket	₹1000-3000 /month
2024	Support And Care Humanity Found	₹500-2000 /week
2019	WeDidIt	Performance Based
2025	InAmigos Foundation	₹1000-4000 /week
2025	InAmigos Foundation	₹1000-4000 /week
2024	InAmigos Foundation	₹1000-4000 /week
2024	Muskurahat Foundation	₹5000-10000 lump sum
2019	Deepak Sabharwal & Associates	₹2000 /month
2026	Muskurahat Foundation	₹5000-10000 lump sum
2026	Support And Care Humanity Found	₹500-2500 /week
2024	Marpu Foundation	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Support And Care Humanity Found	₹500-2000 /week
2026	NayePankh Foundation	Performance Based
2026	Marpu Foundation	Performance Based
2024	Marpu Foundation	Performance Based
2025	DevTown.in	₹5000 /month
2024	InAmigos Foundation	₹1000-5000 /week
2024	Muskurahat Foundation	₹5000-10000 lump sum
2018	Support And Care Humanity Found	₹500-2000 /week
2025	Support And Care Humanity Found	₹500-2000 /week
2025	Support And Care Humanity Found	₹500-2000 /week
2025	NayePankh Foundation	Performance Based
2024	InAmigos Foundation	₹1000-4000 /week
2023	InAmigos Foundation	₹1000-5000 /week
2020	Marpu Foundation	Performance Based
2023	Vikram Singh	₹3000 /month
2021	Support And Care Humanity Found	₹500-2500 /week
2024	Six Sports	₹1000 /month
2022	Glamwizz India Private Limited	₹10000 /month
2022	Marpu Foundation	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2026	Hamari Pahchan NGO	Performance Based
2020	Hamari Pahchan NGO	Performance Based
2016	Support And Care Humanity Found	₹500-2000 /week
2023	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2025	Hamari Pahchan NGO	Performance Based
2023	Support And Care Humanity Found	₹500-2500 /week
2024	Support And Care Humanity Found	₹500-2500 /week
2016	Support And Care Humanity Found	₹500-2000 /week
2023	Dynastymart Retail (OPC) Private L	₹1000-5000 /month
2023	Team Everest	Performance Based
2026	Team Everest	Performance Based
2023	Eduversity Of Danmark	₹5000 /month
2023	ICHARS Support Foundation	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2023	Jankalyan Multipurpose Education	Performance Based
2023	Jankalyan Multipurpose Education	Performance Based
2023	Team Everest	Performance Based

2024	Team Everest	Performance Based
2015	Hamari Pahchan NGO	Performance Based
2026	InAmigos Foundation	₹1000-4000 /week
2024	InAmigos Foundation	₹1000-4000 /week
2022	Legisnations	Performance Based
2019	Support And Care Humanity Found	₹500-2000 /week
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2023	Dynastymart Retail (OPC) Private L	₹1000-5000 /month
2024	Marpu Foundation	Performance Based
2024	Support And Care Humanity Found	₹500-2000 /week
2024	NayePankh Foundation	₹5000-10000 lump sum
2024	Hamari Pahchan NGO	Performance Based
2023	Support And Care Humanity Found	₹500-2500 /week
2024	Team Everest	Performance Based
2022	A2Z Supermarket	₹1000-5000 /month
2020	A2Z Supermarket	₹ 2,00,000 - 2,50,000 /year
2021	Six Sense Mobility	₹2000 /month + Incentives
2024	InAmigos Foundation	₹1000-4000 /week
2024	Team Everest	Performance Based
2024	Team Everest	Performance Based
NA	Team Everest	Performance Based
2024	Team Everest	Performance Based
2020	AeroLeads	₹ 3,00,000 - 4,00,000 /year
2024	ICHARS Support Foundation	Performance Based
2020	Crazy For Success Foundation	Performance Based
2019	Deepak Sabharwal & Associates	₹2000 /month
2021	Stock Tackler	₹1000-5000 /month
NA	InAmigos Foundation	₹1000-4000 /week
2022	Hamari Pahchan NGO	Performance Based
2024	Sapna Singhal	₹1000 /month
2024	NSS IIT Delhi	Performance Based
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2023	Marpu Foundation	Performance Based
2023	Marpu Foundation	Performance Based
2024	Marpu Foundation	Performance Based
2023	Marpu Foundation	Performance Based
2024	Marpu Foundation	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2023	Hamari Pahchan NGO	Performance Based
2026	Hamari Pahchan NGO	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2016	InAmigos Foundation	₹1000-5000 /week
2020	Marpu Foundation	Performance Based
2021	Support And Care Humanity Found	₹500-2000 /week
2019	RR Legal Partners	Performance Based
2023	Hamari Pahchan NGO	Performance Based

2022	Marpu Foundation	Performance Based
2021	Hamari Pahchan NGO	Performance Based
2018	Hamari Pahchan NGO	Performance Based
2021	Marpu Foundation	Performance Based
2024	Marpu Foundation	Performance Based
2020	Marpu Foundation	Performance Based
2020	Marpu Foundation	Performance Based
2022	Marpu Foundation	Performance Based
2023	Marpu Foundation	Performance Based
2023	Jankalyan Multipurpose Education	Performance Based
2022	Contentlane	₹5000 /month
2022	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2022	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2021	Good Tripp	₹3000 /month
2023	Marpu Foundation	Performance Based
2026	Tare Zameen Foundation	₹1000 /month + Incentives
2026	Tare Zameen Foundation	₹1000 /month + Incentives
2023	Tare Zameen Foundation	₹1000 /month + Incentives
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2022	WWF India	₹15000 /month
2026	InAmigos Foundation	₹1000-4000 /week
2023	Marpu Foundation	Performance Based
2026	Marpu Foundation	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2023	Hamari Pahchan NGO	Performance Based
2024	Marpu Foundation	Performance Based
2024	Support And Care Humanity Found	₹500-2000 /month
2023	APOGEE, BITS Pilani	Performance Based
2024	Careers360	Performance Based
2026	Support And Care Humanity Found	₹500-2000 /month
2023	Youth Empowerment Foundation	₹10000 lump sum
2023	Team Everest	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2023	Support And Care Humanity Found	₹500-2000 /month
2024	Marpu Foundation	Performance Based
2017	Marpu Foundation	Performance Based
2021	Team Everest	Performance Based
2026	Muskurahat Foundation	₹5000-10000 lump sum
2026	Muskurahat Foundation	₹5000-10000 lump sum
2026	Muskurahat Foundation	₹5000-10000 lump sum
2023	Muskurahat Foundation	₹5000-10000 lump sum
2026	Marpu Foundation	Performance Based
2026	Marpu Foundation	Performance Based
2024	Team Everest	Performance Based
2025	APOGEE, BITS Pilani	Performance Based
2024	TechEra Knowledge And Careers	₹1000-7000 /month
2015	Youth Empowerment Foundation	₹5000 /month

2017	Alphause Digital Consultancy Priva	₹2500-3500 /month
2024	Muskurahat Foundation	₹5000-10000 lump sum
2026	Muskurahat Foundation	₹5000-10000 lump sum
2025	Tryst, IIT Delhi	Performance Based
2023	Tryst, IIT Delhi	Performance Based
2024	Tryst, IIT Delhi	Performance Based
2024	Udaghosh Social Welfare Society	Performance Based
2026	Hamari Pahchan NGO	Performance Based
2020	Support And Care Humanity Founc	₹500-2000 /week
2024	Support And Care Humanity Founc	₹500-2000 /month
2019	Think Act Rise Foundation	Performance Based
2020	Amar Saini	Performance Based
2023	Youth Empowerment Foundation	Performance Based
2023	QArt Fashion	₹5000 /month
2023	Hamari Pahchan NGO	Performance Based
2016	ChatWise UK Limited	Performance Based
2025	ChatWise UK Limited	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2016	Piktureperfkt Photography	₹1000 /month + Incentives
2024	Dynastymart Retail (OPC) Private L	₹1000 /month
2025	Dynastymart Retail (OPC) Private L	₹1000 /month
2024	Dynastymart Retail (OPC) Private L	₹1000 /month
2023	Muskurahat Foundation	₹5000-10000 lump sum
2026	Muskurahat Foundation	₹5000-10000 lump sum
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2026	Tare Zameen Foundation	₹1000 /month + Incentives
2025	Tryst, IIT Delhi	Performance Based
2023	Muskurahat Foundation	₹5000-10000 lump sum
2026	Jankalyan Multipurpose Education	Performance Based
2025	Support And Care Humanity Founc	₹500-2000 /week
2024	High Pexel	₹5000 /month
2025	Muskurahat Foundation	₹5000-10000 lump sum
2025	Hamari Pahchan NGO	Performance Based
2025	Support And Care Humanity Founc	₹500-2000 /week
2025	Jankalyan Multipurpose Education	Performance Based
NA	Support And Care Humanity Founc	₹500-2000 /week
2017	Guest Blogging Technology	₹10000-20000 /month
2024	Crazy For Success Foundation	Performance Based
2016	Hamari Pahchan NGO	Performance Based
2025	Hamari Pahchan NGO	Performance Based
2020	ESSI Integrated Technologies	₹2000 /week
2025	Muskurahat Foundation	₹5000-10000 lump sum
2023	KindBeings	₹1000 /month
2024	Hamari Pahchan NGO	Performance Based
2016	Tillotoma Foundation	Performance Based
2024	Crazy For Success Foundation	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Pedallers Choice	₹5000 /month
2024	Indika AI Private Limited	₹400 /week
2024	Speak Up World Foundation	Performance Based

2023	A2Z Supermarket	₹1000 /month
2023	Medical Dialogues LLP	₹10000 /month
2014	Hamari Pahchan NGO	Performance Based
2017	Stone Reflection Branding	₹1000 /month
2020	Deepak Sabharwal & Associates	₹2000 /month
2025	Idea Usher	₹8000-12000 /month
2021	TAS World	₹10000-12000 /month
2024	Quest 4 Crest	₹7000 /month
2026	Hamari Pahchan NGO	Performance Based
2024	Netram Foundation	₹4000 /month
2024	BubbleWrap	₹10000 /month
2025	Muskurahat Foundation	₹5000-10000 lump sum
2021	Muskurahat Foundation	₹5000-10000 lump sum
2021	Muskurahat Foundation	₹5000-10000 lump sum
2025	Marpu Foundation	Performance Based
NA	InAmigos Foundation	₹1000-4000 /week
2023	Tare Zameen Foundation	₹1000 /month + Incentives
2025	Tare Zameen Foundation	₹1000 /month + Incentives
2022	Clavictor Academy Private Limited	₹3000-10800 /month
2021	Suvidha Foundation	Performance Based
2024	True And Top Stories World LLP	₹5000 /month
2025	InAmigos Foundation	₹1000-4000 /week
2022	SmasHR Global	₹ 2,00,000 - 3,00,000 /year
2023	Marpu Foundation	₹5000 /month
2023	Marpu Foundation	Performance Based
2025	Marpu Foundation	Performance Based
2021	Tare Zameen Foundation	₹1000 /month + Incentives
2023	Public Policy Research Centre	₹ 2,00,000 - 4,00,000 /year
2026	Hamari Pahchan NGO	Performance Based
2025	Support And Care Humanity Found	₹1500-2000 /month
2023	A2Z Supermarket	₹1000-10000 /month
2022	Tasuvure	₹25000 /month
2024	Muskurahat Foundation	₹5000-10000 lump sum
2023	Hamari Pahchan NGO	Performance Based
2026	Tare Zameen Foundation	₹1000 /month + Incentives
2022	DigitalPly	₹6000 /month
2023	Firestorm	₹7500 /month
2024	Mavani Digital	₹5000 /month
2022	Socioven Global Private Limited	₹10000-15000 /month
2016	Muskurahat Foundation	₹5000-10000 lump sum
2016	Muskurahat Foundation	₹5000-10000 lump sum
2019	Youth Empowerment Foundation	Performance Based
2023	Support And Care Humanity Found	₹1500-2000 /month
2024	Hamari Pahchan NGO	Performance Based
2023	Tare Zameen Foundation	Performance Based
2026	Muskurahat Foundation	₹5000-10000 lump sum
2026	Muskurahat Foundation	₹5000-10000 lump sum
2026	InAmigos Foundation	₹1000-4000 /week
2022	Marpu Foundation	Performance Based
NA	Marpu Foundation	Performance Based

2026	Muskurahat Foundation	₹5000-10000 lump sum
2022	Muskurahat Foundation	₹5000-10000 lump sum
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2022	Hamari Pahchan NGO	Performance Based
NA	Muskurahat Foundation	₹5000-10000 lump sum
2022	Muskurahat Foundation	₹5000-10000 lump sum
2026	Mahima Varshney	₹18000 /month
2019	Barahami Legal Services	₹3000-10000 /month
2024	TechEra Knowledge And Careers	₹2000-6000 /month
2024	A2Z Supermarket	₹3000 /month
2022	Muskurahat Foundation	₹5000-10000 lump sum
2022	Muskurahat Foundation	₹5000-10000 lump sum
2022	Muskurahat Foundation	₹5000-10000 lump sum
2023	Muskurahat Foundation	₹5000-10000 lump sum
2024	Hamari Pahchan NGO	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2025	Boddhi Tree Foundation	Performance Based
2025	Suvidha Foundation	Performance Based
2022	Tare Zameen Foundation	₹1000 /month + Incentives
2018	The Vision Foundation	Performance Based
2024	InAmigos Foundation	₹1000-5000 /week
2024	Marpu Foundation	Performance Based
2019	Marpu Foundation	Performance Based
2022	XcitEducation Foundations	Performance Based
2016	Learn10x	₹8000-12000 /month
2022	Learn10x	₹8000-12000 /month
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2022	SWOPL Group	₹12000-20000 /month
2021	Fynii Infotech Private Limited	₹6000-10000 /month
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	InAmigos Foundation	₹1000-4000 /week
2023	Hamari Pahchan NGO	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	InAmigos Foundation	₹1000-4000 /week
2021	InAmigos Foundation	₹1000-4000 /week
2024	InAmigos Foundation	₹1000-4000 /week
NA	Marpu Foundation	Performance Based
2026	Marpu Foundation	Performance Based
NA	ICHARS	Performance Based
2023	Muskurahat Foundation	₹5000-10000 lump sum
2026	InAmigos Foundation	₹1000-4000 /week
2021	Growth Cattalyst	₹9000-12000 /month
2024	Hamari Pahchan NGO	Performance Based
2023	The Entrepreneurs Of India	₹3500 /month

NA	Hamari Pahchan NGO	Performance Based
2023	Marpu Foundation	Performance Based
2023	Muskurahat Foundation	₹3000-10000 lump sum
NA	Muskurahat Foundation	₹5000-10000 lump sum
2023	Hamari Pahchan NGO	Performance Based
2024	Angel Broking	₹1000 /month + Incentives
2024	Growmo Spot	₹1000 /month
2021	Combonation	₹7000 /month
2023	INDIA Redefined	Performance Based
2023	Muskurahat Foundation	₹5000-10000 lump sum
2023	Support And Care Humanity Found	₹1500-2000 /month
2023	Muskurahat Foundation	₹5000-10000 lump sum
2023	Muskurahat Foundation	₹5000-10000 lump sum
2024	99 Cosmetic	₹2000 /month + Incentives
2022	Tare Zameen Foundation	₹1000 /month + Incentives
2023	Tare Zameen Foundation	₹1000 /month + Incentives
2023	Tare Zameen Foundation	₹1000 /month + Incentives
2024	Hamari Pahchan NGO	Performance Based
2023	ENVISAGE INDIA MULTIBIZ PVT LT	₹20000-30000 /month
2023	Youth Empowerment Foundation	Performance Based
2024	Youth Empowerment Foundation	Performance Based
2022	PMS Consulting	₹6000 /month
2023	ICHARS	Performance Based
NA	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2017	Spill Your Thoughts	₹10000 lump sum
2022	Youth Empowerment Foundation	Performance Based
2024	Youth Empowerment Foundation	Performance Based
2024	Muskurahat Foundation	₹3000-10000 lump sum
2024	Hamari Pahchan NGO	Performance Based
2026	Muskurahat Foundation	₹3000-10000 lump sum
2026	Muskurahat Foundation	₹5000-10000 lump sum
NA	Muskurahat Foundation	₹3000-10000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
NA	Muskurahat Foundation	₹5000-10000 lump sum
NA	Hamari Pahchan NGO	Performance Based
2024	ICHARS	Performance Based
NA	INDIA Redefined	Performance Based
2023	Muskurahat Foundation	₹5000-10000 lump sum
2023	Muskurahat Foundation	₹5000-10000 lump sum
2024	Youth Empowerment Foundation	Performance Based
2024	Youth Empowerment Foundation	Performance Based
2023	Hamari Pahchan NGO	Performance Based
2024	Akansha Sharma	₹10000 /month
2023	Krsh Welfare Foundation	Performance Based
2024	SARAL BHARAT NEWS	₹1000 /month + Incentives
2023	Muskurahat Foundation	₹5000-10000 lump sum
2026	Hamari Pahchan NGO	Performance Based
2022	Hamari Pahchan NGO	Performance Based

2024	Hamari Pahchan NGO	Performance Based
NA	Hamari Pahchan NGO	Performance Based
2020	Al Naya International LLC	₹3000 /month
2022	ICHARS	Performance Based
2026	Hamari Pahchan NGO	Performance Based
2022	No Help Too Big	Performance Based
2023	ICHARS	Performance Based
2024	Simmi Foundation Organization	Performance Based
2024	Diamond Fantasies Welfare Societ	Performance Based
2024	FirstCuriosity	₹5000 /month
2022	Shri Navodaya Society Of Social W	Performance Based
2024	Hamari Pahchan NGO	Performance Based
2024	HappiMynd	₹1000-3000 lump sum
NA	Hamari Pahchan NGO	Performance Based
NA	Hamari Pahchan NGO	Performance Based
2026	Neha Srivastava	₹10000-35000 /month
2020	SARAL BHARAT NEWS	₹1000 /month + Incentives
2016	SARAL BHARAT NEWS	₹1000 /month + Incentives
2024	ICHARS	Performance Based
2024	ValidEdge	₹3001 /month
2023	Hamari Pahchan NGO	Performance Based
2020	Support And Care Humanity Found	₹1500 /month
2023	BZ Consultant	₹2000 lump sum
2024	Muskurahat Foundation	₹5000-10000 lump sum
2022	Muskurahat Foundation	₹5000-10000 lump sum
2022	A2Z Supermarket	₹1000-1500 /month
2022	Hamari Pahchan NGO	Performance Based
2022	Today's Kalam Foundation	Performance Based
2024	ICHARS	Performance Based
2022	Hamari Pahchan NGO	Performance Based
2026	Muskurahat Foundation	₹5000-10000 lump sum
2022	Material Library	₹10000 /month
2017	Karma Foundation	Performance Based
2023	Odisha Development Managemen	₹300-3000 /week
2016	SARAL BHARAT NEWS	₹2000 /month
2021	Tare Zameen Foundation	₹1000 /month + Incentives
2022	Essence	₹15000 /month
2023	Boxiliq LLP	₹1000 /month
2018	Supreme Law House LLP	Performance Based
2016	SARAL BHARAT NEWS	₹1000 /month + Incentives
2018	Dhruv Babbar	Performance Based
2022	Tare Zameen Foundation	₹1000 /month + Incentives
2019	Teach For India	Performance Based
2018	BornHi Digital	₹6000 /month
2024	SEOMantra.Pro	₹1500 /month
2023	International Institute Of SDGs & I	Performance Based
2022	Solvaphile	₹17500 /month
2017	Solvaphile	₹15000 /month
2026	Hamari Pahchan NGO	Performance Based
2026	Muskurahat Foundation	₹5000-10000 lump sum

2021	Backbenchers Foundation	₹15000 /month
2020	Blue Rose Publishers	₹20000 /month
2022	Price & Poors Inc	₹3000-10000 /month
2023	Skillvoid Technologies LLP	₹5000 /month + Incentives
2024	Muskurahat Foundation	₹5000-10000 lump sum
2021	Sukhad Foundation (Hamari Pahch	₹2000-30000 /month
2024	Backbenchers Foundation	Performance Based
2024	Muskurahat Foundation	₹5000-10000 lump sum
2023	Tare Zameen Foundation	₹1000 /month + Incentives
2024	Tare Zameen Foundation	₹1000 /month + Incentives
2023	ShoppersBFF	₹3000 /month
2024	Muskurahat Foundation	₹5000-10000 lump sum
2022	Dyeus	₹10000-20000 /month
2022	Bizgurukul Private Limited	₹15000 /month + Incentives
2024	Muskurahat Foundation	₹5000-10000 lump sum
2014	Hamari Pahchan NGO	Performance Based
2024	Jankalyan Multipurpose Education	Performance Based
2024	The Backbenchers	₹15000 /month
2019	Sikshalay Labs Private Limited	₹4500 /month
2024	Reviewdunk	₹1000 /month
2023	RNT DIGITAL	₹1000-5000 /month
2017	Tillotoma Foundation	Performance Based
2024	Odisha Development Managemen	₹300-3000 /week
2026	Hamari Pahchan NGO	Performance Based
2023	Hariyali	Performance Based
2017	Hariyali	Performance Based
2026	Hamari Pahchan NGO	Performance Based

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- Ongoing Events

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March 20, 2023 - March 30, 2023

SDP

Zakir Husain Delhi College organising Student Development Program on LaTeX

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. Dhiraj Kumar Singh
FOSS : LaTeX

Registration open from **March 15, 2023, till March 19, 2023**

Dec. 21, 2022 - Jan. 3, 2023

SDP

Zakir Husain Delhi College organising Student Development Program on R

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. DHIRAJ KUMAR SINGH
FOSS : R

Registration open from **Dec. 6, 2022, till Dec. 20, 2022**

Aug. 25, 2022 - Sept. 8, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on Python 3.4.3

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : Python 3.4.3

Registration open from **Aug. 18, 2022, till Aug. 23, 2022**

June 16, 2022 - June 30, 2022

Zakir Husain Delhi College organising Student Development Program on Chemcollective Virtual

SDP

Labs

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : ChemCollective Virtual Labs

Registration open from **June 8, 2022, till June 14, 2022**

March 11, 2022 - March 25, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on Python 3.4.3

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : Python 3.4.3

Registration open from **March 4, 2022, till March 8, 2022**

Feb. 14, 2022 - Feb. 28, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on R

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : R

Registration open from **Jan. 31, 2022, till Feb. 10, 2022**

Dec. 21, 2022 - Jan. 3, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on R

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. DHIRAJ KUMAR SINGH
FOSS : R

Registration open from **Dec. 6, 2022, till Dec. 20, 2022**

Jan. 15, 2021 - Jan. 30, 2021

SDP

Zakir Husain Delhi College, University of Delhi Organising SDP on R Programming

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. Dhiraj Kumar
FOSS : R

Registration open from **Jan. 7, 2021, till Jan. 12, 2021**

Oct. 1, 2020 - Oct. 15, 2020

SDP

Programing in Python

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. Dhiraj Kumar Singh
FOSS : Python 3.4.3

Registration open from **Sept. 22, 2020, till Sept. 28, 2020**

- FOSSEE Project
- Scilab
- eSim (Oscad)
- Python
- OpenFoam (CFD)

- Aakash Labs
- Co-learn
- Education Mission

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- Training Dashboard
- Creation Dashboard

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- Past Events

Aug. 25, 2022 - Sept. 8, 2022

FDP

Zakir Husain Delhi College organising Faculty Development Program on Python 3.4.3

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : Python 3.4.3

Registration open from **Aug. 18, 2022, till Aug. 23, 2022**

June 16, 2022 - June 30, 2022

FDP

Zakir Husain Delhi College organising Faculty Development Program on Chemcollective Virtual Labs

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra Gawade
FOSS : ChemCollective Virtual Labs

Registration open from **June 8, 2022, till June 14, 2022**

- FOSSEE Project
- Scilab
- eSim (Oscad)
- Python
- OpenFoam (CFD)

- Aakash Labs
- Co-learn
- Education Mission

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University of Delhi

All India Institute of Medical Sciences (AIIMS) Delhi

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National Thalassemia Welfare Society

Awareness, timely screening and counselling are key to reducing the burden of genetic and chronic diseases

21st Feb 2023 | 10:00 AM | Salman Ghani Hashmi Auditorium, Zakir Husain Delhi College

in association with

Zakir Husain Delhi College,
University of Delhi,
under the aegis of IQAC, DBT STAR College

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Principal investigator: Prof. K. N. Saraswathy (DU); Co-Investigators: Prof. Benrithung Murry (DU); Prof. R. P. Mitra (DU); Dr. N. Kiranmala Devi (DU); Prof. Roumi Deb (Amity); Dr. Seema Tyagi (AIIMS); Dr. Ravi Ranjan (AIIMS); Dr. J. S. Arora (NTWS)

Coordinators: Prof. Narendra Singh (Principal, Zakir Husain Delhi College)
Prof. P. K. Sisodia (Coordinator, IQAC & DBT star College Scheme, Zakir Husain Delhi College)
Dr. Ragesh P. R. (Teacher-In-Charge, Department of Zoology, Zakir Husain Delhi College)
Dr. Sunil Kumar (Department of Zoology, Zakir Husain Delhi College)
Dr. Md. Arafat Hussain (Department of Zoology, Zakir Husain Delhi College)

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Guru Angad Dev
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SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI

Date: 11th September 2023

To whomsoever it may concern

This is to certify that **DR. SARITA PASSEY**, **ZAKIR HUSAIN DELHI COLLEGE, UNIVERSITY OF DELHI** has contributed as **Co-Coordinator** in One Month Online National Faculty Induction Programme/ Orientation Course organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education held from **20th June 2023 to 19th July 2023**.

Prof. Vimal Rarh
Project Head & Joint Director
GAD-TLC of Ministry of Education

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SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI

21st September 2022

To whomsoever it may Concern

This is to certify that **PROF. SARITA PASSEY** of **ZAKIR HUSSAIN COLLEGE UNIVERSITY OF DELHI** has contributed as **Member of the Organizing Committee** in One-Week Online National Faculty Development Programon "Safer and Greener Chemistry Labs" organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education, held from **19th July 2022 to 25th July 2022**.

Dr. Vimal Rarh
Project Head & Joint Director
GAD-TLC of Ministry of Education

ZAKIR HUSAIN DELHI COLLEGE
(UNIVERSITY OF DELHI)
Jawaharlal Nehru Marg, New Delhi - 110002
Tel.: 011-23232218, 23232219, 23233420, Fax : 011-23215906
Website:www.zakirhusaindelhicollege.in
email:zakirhusaindelhicollege@gmail.com

ज़ाकिर हुसैन दिल्ली कॉलेज
(दिल्ली विश्वविद्यालय)
जवाहरलाल नेहरू मार्ग, नई दिल्ली - 110002
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इ-मेल: zakirhusaindelhicollege@gmail.com

Guru Angad Dev
TEACHING LEARNING CENTRE

A Centre under Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT), MHRD, Govt. of India.

SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI

Date: 11th September 2023

To whomsoever it may concern

This is to certify that **DR. SARITA PASSEY**, **ZAKIR HUSAIN DELHI COLLEGE, UNIVERSITY OF DELHI** has contributed as **Organizing Secretary** in One-Week Online National Faculty Development Program on **"Development of MOOCs, e- Content and Teacher's e-Kit in Four Quadrant Format"** organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education held from **08th December to 14th December 2022**.

Prof. Vimal Rarh
Project Head & Joint Director
GAD-TLC of Ministry of Education

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SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI

Date: 11th September 2023

To whomsoever it may concern

This is to certify that **DR. SARITA PASSEY**, **ZAKIR HUSAIN DELHI COLLEGE, UNIVERSITY OF DELHI** has contributed as **Co-Coordinator** in One-Month Online National Faculty Induction Programme/ Orientation Course organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education held from **25th February to 27th March 2023**.

Prof. Vimal Rarh
Project Head & Joint Director
GAD-TLC of Ministry of Education

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SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI

Date: 11th September 2023

To whomsoever it may concern

This is to certify that **DR. SARITA PASSEY**, **ZAKIR HUSAIN DELHI COLLEGE, UNIVERSITY OF DELHI** has contributed as **Co-Coordinator** in One-Week Online National Faculty Development Program on "MOOCs and e-Content Development" organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education held from **29th April to 05th May 2023**.

Prof. Vimal Rarh
Project Head & Joint Director
GAD-TLC of Ministry of Education

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SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI

Date: 11th September 2023

To whomsoever it may concern

This is to certify that **DR. SARITA PASSEY**, **ZAKIR HUSAIN DELHI COLLEGE, UNIVERSITY OF DELHI** has contributed as **Co-Coordinator** in One Month Online National Faculty Induction Programme/ Orientation Course organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education held from **20th June 2023 to 19th July 2023**.

Prof. Vimal Rarh
Project Head & Joint Director
GAD-TLC of Ministry of Education

Gmail RUCHI VIR <ruchivir@zh.du.ac.in>

Institute visit on 23.09.2022

11 messages

RUCHI VIR <ruchivir@zh.du.ac.in> Wed, 14 Sep 2022 at 10:55 AM
To: <training@ihbt.res.in>, TABASSUM JEHAN <tabassumjehan@zh.du.ac.in>, <putan.singh@icar.gov>, putan60@gmail.com <putan60@gmail.com>

Dear Sir

Greetings from Zakir Husain Delhi College!!!

This is with reference to the above mentioned subject, I request you to arrange a Visit to your institute for our B. Sc (H) Botany students and faculty members on 23.09.2022. As we will be coming from Delhi and visiting the institute on our way to Mcleodganj, kindly give us the morning slot for the same.

Thank you

Warm Regards

Dr Ruchi Vir
Assistant Professor
Department of Botany
Zakir Husain Delhi college
University of Delhi
New Delhi-110003

Mail Delivery Subsystem <mailer-daemon@googlemail.com> Wed, 14 Sep 2022 at 10:56 AM
To: <ruchivir@zh.du.ac.in>

Error Icon

Address not found

Your message wasn't delivered to **putan.singh@icar.gov** because the domain icar.gov couldn't be found. Check for typos or unnecessary spaces and try again.

LEARN MORE

The response was:

```
DNS Error: DNS type 'mx' lookup of icar.gov responded with code NXDOMAIN Domain name
not found: icar.gov Learn more at https://support.google.com/mail/?p=BadRcptDomain
```

[Quoted text hidden]

INCHARGE TRAINING CSIR IHBT <training@ihbt.res.in> Wed, 14 Sep 2022 at 11:59 AM
To: <ruchivir@zh.du.ac.in>
Cc: Gireesh Nadda <girish@ihbt.res.in>

Dear Sir/ Madam,

Greetings from CSIR-IHBT, Palampur.!

As per your request, your faculty members and students are most welcome to visit our Institute on Friday (23.09.2022).

Kindly provide the contact number of accompanying staff and intimate us about the exact number of students, teachers and tentative time of reaching at CSIR-IHBT, Palampur.

It is to inform you that no photography is allowed in the lab during your visit, we will share the photos with you and you have to follow the guidelines/ advisory related to Covid-19 issued by the government or by CSIR/ CSIR-IHBT at the time of visit.

From: ruchivir@zh.du.ac.in
To: "INCHARGE TRAINING CSIR IHBT" <training@ihbt.res.in>, tabassumjehan@zh.du.ac.in, "putan singh" <putan.singh@icar.gov>, putan60@gmail.com
Sent: Wednesday, September 14, 2022 10:55:47 AM
[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Sun, 18 Sep 2022 at 9:49 AM
To: BABEETA C KAULA <dr.bckaula@zh.du.ac.in>

[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Sun, 18 Sep 2022 at 10:02 AM
To: BABEETA C KAULA <dr.bckaula@zh.du.ac.in>, TABASSUM JEHAN <tabassumjehan@zh.du.ac.in>, <training@ihbt.res.in>

Good morning!!!

Dear sir

My apologies for delayed reply. I would like to inform you that due to some logistics reasons there are changes in our schedule, we will now be able to visit IHBT on Monday 26 September, 11.30 AM. Number of students visiting the institute is around 30 accompanied by 2-3 faculty members. The phone number of faculty member Dr. Tabassum Jehan is as follows 9868170771.
Kindly allow us to visit your institute we agree to all the guidelines that you have mentioned in previous email regarding visit.

Thank you

Warm regards

Dr. Ruchi Vir
[Quoted text hidden]

INCHARGE TRAINING CSIR IHBT <training@ihbt.res.in> Mon, 19 Sep 2022 at 10:45 AM
To: <ruchivir@zh.du.ac.in>

Dear Madam/Sir,

As per your request, You are most welcome to visit our Institute on 26.09.2022.

From: ruchivir@zh.du.ac.in
To: "dr bckaula" <dr.bckaula@zh.du.ac.in>, tabassumjehan@zh.du.ac.in, "INCHARGE TRAINING CSIR IHBT"

<training@ihbt.res.in>
Sent: Sunday, September 18, 2022 10:02:34 AM
Subject: Re: Institute visit on 23.09.2022
[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Mon, 19 Sep 2022 at 12:36 PM
To: INCHARGE TRAINING CSIR IHBT <training@ihbt.res.in>

Thank you sir for accepting our request. Kindly share mobile number so that we can communicate with you.

Thank you

Warm regards
[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Mon, 19 Sep 2022 at 12:36 PM
To: TABASSUM JEHAN <tabassumjehan@zh.du.ac.in>, <dr.bckaula@gmail.com>

[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Wed, 21 Sep 2022 at 8:40 PM
To: TABASSUM JEHAN <tabassumjehan@zh.du.ac.in>, <dr.bckaula@gmail.com>

Good evening sir

This is with reference our visit at your institution on 26.09.22, I will be grateful if you can arrange lunch for 38 people in your canteen.

Thank you very much

Thank you
[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Wed, 21 Sep 2022 at 8:41 PM
To: INCHARGE TRAINING CSIR IHBT <training@ihbt.res.in>

Good evening sir

This is with reference our visit at your institution on 26.09.22, I will be grateful if you can arrange lunch for 38 people in your canteen.

Thank you very much

Warm regards
[Quoted text hidden]

RUCHI VIR <ruchivir@zh.du.ac.in> Thu, 22 Sep 2022 at 11:25 AM
To: <director@ihbt.res.in>

[Quoted text hidden]

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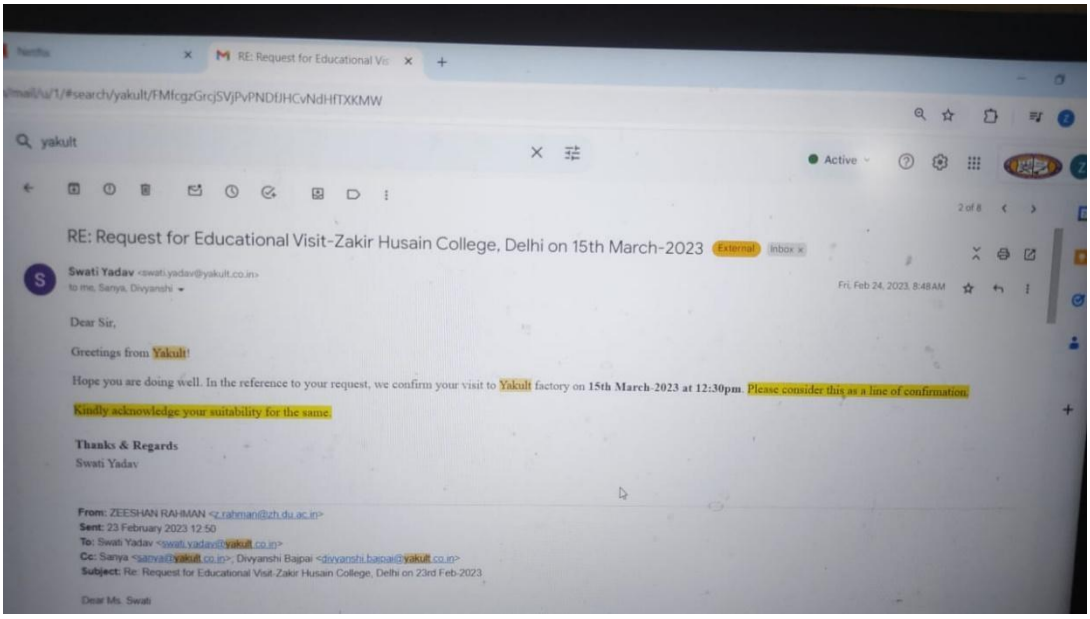
Visit to Yakult Danone , Karnal



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इ-मेल: zakirhusaindelhicollege@gmail.com

Vibha
आज़ादी का अमृत महोत्सव
संस्कृति मंत्रालय MINISTRY OF CULTURE

INTERNATIONAL CONFERENCE

on contributions of

ACHARYA PRAFULLA CHANDRA RAY
AS A CHEMIST AND FREEDOM FIGHTER

CERTIFICATE
OF APPRECIATION

This is to certify that **DR. JYOTI SINGH** from **Chemistry Department, Zakir Husain Delhi college, University of Delhi** has actively contributed as Coordinator/Organizer/Moderator for the International Conference on Contributions of Acharya Prafulla Chandra Ray as a Chemist and Freedom Fighter held on 11-12 Sravana, 1944 (02-03 August, 2022) as a part of the Azadi ka Amrit Mahotsava organised by Vijnana Bharati & Ministry of Culture, Government of India in Association with Indraprastha Vigyan Bharati and Department of Chemistry, University of Delhi.

Dr. Arvind C. Ranade
Secretary
Vijnana Bharati

Smt. Priyanka Chandra
Director, AKAM
Ministry of Culture

Prof. Ashok K. Prasad
Head, Department of Chemistry
University of Delhi

Vibha
Indraprastha Vigyan Bharati

Department of Chemistry
UNIVERSITY OF DELHI

Gmail DR. A MAHESHWARI <ankmaheshwari@gmail.com>

Regarding Educational Visit

National Museum, Department of Education <educationnationalmuseum@gmail.com> Tue, Apr 11, 2023 at 12:12 PM

To: "Dr. Ankur Maheshwari" <ankmaheshwari@gmail.com>
Cc: Rige Shiba <rige.shiba6@gmail.com>, Nazia Kamal <naziakamal05@gmail.com>

Dear Mr. Maheshwari,

Greetings from the National Museum, New Delhi.

We are confirming your visit for the 18th of April at 10:00 AM with 55 students only.

May I request you to kindly follow the below-mentioned guidelines during your visit:

1. Please carry a copy of the letterhead signed by the head of the department or principal mentioning the number of students and teachers visiting the museum and submit it at the ticket counter.

2. The group will **NOT** be allocated any guide.

3. Please assemble near the Auditorium.

4. Teachers will have to pay an entry fee of 20 rupees each while students' entry fee is exempted.

5. Please make sure that you reach the museum by **09:55 AM** sharp to avoid any last-minute delays.

6. Please note that **the students are not allowed to carry bags inside the Museum.** We would request you to **kindly leave the bags in your respective buses** and carry only a small notebook along with a pen/pencil and a water bottle inside the museum premises.

7. Please check at the ticket counter about the nearest parking station (The parking facility at the museum is not available at the moment).

8. In case you wish to cancel your tour, please let us know in advance so that we can allot the same slot to some other schools that are on the waiting list.

For any other queries please feel free to get in touch with us at 011-23019272 (Ext- 237). For any assistance regarding the arrangement of lunch please contact the cafeteria contact person- at 9810953127.

Best regards,
Javeria Tanveer

On Mon, Apr 10, 2023 at 6:40 PM Dr. Ankur Maheshwari <ankmaheshwari@gmail.com> wrote:

> Dear Sir/Madam,
>
> Due to some administrative issues we will not be able to visit the museum tomorrow, 11th April 2023, We request you to kindly reschedule the visit on 18th of April, 2023 at 10:00 am. We will be highly grateful to you.
>
> Thanking you,
>
> Yours Sincerely,
>
> Dr. Ankur Maheshwari
> Department of Zoology
> Zakir Husain Delhi College
> University of Delhi
> JLN Marg, New Delhi-110002

On Mon, 10 Apr, 2023, 10:42 am National Museum, Department of Education, <educationnationalmuseum@gmail.com> wrote:

Dear Mr. Maheshwari,

Greetings from the National Museum, New Delhi.

We are confirming your visit for the 11th of April at 10:00 AM with 55 students only.

May I request you to kindly follow the below-mentioned guidelines during your visit:

1. Please carry a copy of the letterhead signed by the head of the department or principal mentioning the number of students and teachers visiting the museum and submit it at the ticket counter.

2. The group will **NOT** be allocated any guide.

3. Please assemble near the Auditorium.

4. Teachers will have to pay an entry fee of 20 rupees each while students' entry fee is exempted.

5. Please make sure that you reach the museum by **09:55 AM** sharp to avoid any last-minute delays.

6. Please note that **the students are not allowed to carry bags inside the Museum.** We would request you to **kindly leave the bags in your respective buses** and carry only a small notebook along with a pen/pencil and a water bottle inside the museum premises.

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8. In case you wish to cancel your tour, please let us know in advance so that we can allot the same slot to some other schools that are on the waiting list.

For any other queries please feel free to get in touch with us at 011-23019272 (Ext- 237). For any assistance regarding the arrangement of lunch please contact the cafeteria contact person- at 9810953127.

Best regards,
Javeria Tanveer

On Sun, Apr 9, 2023 at 11:21 AM Dr. Ankur Maheshwari <ankmaheshwari@gmail.com> wrote:

The Director General,
National Museum
Janpath
New Delhi-110001

Kind Attn: Education Department

Respected Madam/Sir,

With due regards, I would like to state that in the syllabus of our B.Sc. Life Science IV semester, students has to visit a museum and submit a report to the department. As per our telephonic conversation In this regard, we wish to visit your institution either on April 11 or April 12, 2023 in morning session at 10:00 am (as per our administration permission). We will be having around 55 students along with 2 teachers and 2 lab-staffs. Kindly confirm on your part so that we can plan accordingly. We would prefer to visit the institute in the morning session. Since it is an educational trip, I would also like to request you to kindly provide the exemption/ concession in the entry fee, if possible.

Looking forward your kind consideration and cooperation.

Waiting for your kind and prompt reply.

Thanking you,

Sincerely yours,

Dr. Ankur Maheshwari
Department of Zoology
Zakir Husain Delhi College
University of Delhi
JLN Marg, New Delhi-110002

ZAKIR HUSAIN DELHI COLLEGE
UNIVERSITY OF DELHI

M T W T F S S
Page No.:
Date: 18/04/23
YOUVA

1. SAKSHI JHA ✓
2. NEHA ✓
3. HIMANSHI CHAUHAN ✓
4. AYAN DAGAR ✓
5. BARKHA PANIGRAHI ✓
6. HEMANT KUMAR ✓
7. NEETU PODDAR ✓
8. NETRA KISHAN ✓
9. ANSHIKA VERMA
10. SRISHTI AGGARWAL
11. KONIKA VERMA
12. BITTU KUMAR
13. LAKSHAY ✓
14. DAMINI ✓
15. SHIVAM KAUSHIK ✓
16. IRSHAD
17. AZAD ANSARI ✓
18. RITESH KUMAR ✓
19. RAVI SHANKAR ✓
20. VIGHYAT GUPTA ✓
21. DEEP RANJAN ✓
22. HARSH SINGH ✓
23 MUSKAAN MAAN ✓
24. SURAJ RANA ✓
25. LAKSHITA SRIVASTAVA ✓
26. SHREYA SRIVASTAVA ✓
27. PALAK SHARMA ✓
28. ANAM KHAN ✓
29. AHSANUL HAQUE
30. AYUSH RAJ ✓
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32. BIPLAB DALAL ✓
33. TOOBA ✓
34. MONU KUMAR ✓
35. SAEHA SHAH ✓
36. ARISHA ZUBAIR
37. CHARVI KHANNA
38. ADARSH KUMAR ✓
39. ANSHUL SINGH ✓
40. VARUN KUMAR ✓
41. ANWAR ✓
42. ISHNA ✓
43. Abishek Pratap Singh ✓

BSC. LIFE SCIENCES 2nd YEAR.

Radiation Physics and Chemistry 206 (2023) 110795

Contents lists available at ScienceDirect

Radiation Physics and Chemistry

journal homepage: www.elsevier.com/locate/radphyschem

Analysis of line intensity ratio for optical transitions of $3d^6$ levels and plasma screening effect on atomic structure of Fe III ion

Falta Yadav [a,*], Arun Goyal [b], Narendra Singh [c]

[a] Department of Physics and Astrophysics, University of Delhi, Delhi, 110007, India
[b] Department of Physics, Shyam Lal College, University of Delhi, Delhi, 110032, India
[c] Zakir Husain Delhi College, University of Delhi, Delhi, 110006, India

ARTICLE INFO

Handling Editor: Dr. Chris Chantler

ABSTRACT

Iron emission lines are observed from most classes of astronomical objects through a wide spectral range from infrared to X-ray. For a useful analysis of these lines, accurate atomic data for neutral iron and its ions is required. In this work, we have done calculations of energy levels and radiative data of Fe III by using the relativistic configuration interaction method with the implementation of the flexible atomic code (FAC). We have calculated emission-line intensity ratios for optical transitions among the fine-structure levels of the $3d^6$ configuration at temperature 10^4 K and density $n_e = 10^4 cm^{-3}$. We have also compared our results with the observed spectra of Herbig-Haro objects HH 202 of Orion Nebula, Planetary Nebula, and NGC 2392, post-asymptotic giant branch star (PAGB) HD341617. We have also discussed various discrepancies between the observed spectra from these nebulae and our calculations. The atomic structure of plasma-embedded Fe III is also analyzed using flexible atomic code (FAC). The graphical study shows that transition wavelengths, oscillator strengths, and transition rates are very sensitive to the plasma environment in the density range $10^{21} cm^{-3}$ to $5 \times 10^{22} cm^{-3}$ and spectral lines associated to $\Delta n = 0$ transitions for Fe III ion are blueshifted. We have also studied the dependence of emission line intensity ratios on plasma density and temperature. We believe that our presented results are useful in spectroscopic analysis and examination of astrophysical and laboratory plasma.

1. Introduction

Iron lines have been recognized as an important component in the spectra of active galactic nuclei (AGNs) and quasars (Temple et al., 2020; Satyapal et al., 2021; Negus et al., 2021; Rose et al., 2015). The spectra of many astrophysical objects are dominated by the Iron lines, some examples of which include photoionized H II regions (Rubin et al., 1997; Esteban et al., 2002; Rodríguez, 2002), novae (Mckenna et al., 1997; Hatzidimitriou et al., 2007) and active galactic nuclei (Sigut and Pradhan, 2003; Sigut et al., 2004; Zhang et al., 2007). The atomic processes for iron and other iron-group ions have been the area of interest due to their applications in astrophysical and laboratory plasmas (Schippers et al., 2016, 2017, 2021; Beerwerth et al., 2019; Schippers and Müller, 2020) and hence several investigations have been done in this field, for example the IRON Project (Hummer et al., 1993). The study of transitions in doubly ionized species has assumed greater importance in the field of astrophysics, as more and more information has been obtained from the Hubble Space Telescope with the help of Goddard High Resolution Spectrograph and the Space Telescope Imaging Spectro graph (Johansson et al., 2000). D. G. Smillie et al. (2006) undertook extensive measurements of doubly ionized Fe group elements, including Cr III, Fe III and Co III because of their dominance in the VUV region of hot (B-type) star spectra. One can see that in previous studies, abundance of iron in planetary nebulae (PNe) is essentially lower than the solar value (Perinotto et al., 1999; Inglada et al., 2009). In previous studies, it has been observed that emission lines of Fe ions can be used in the diagnosis and estimation of iron abundance from early B-type stellar spectra (Thompson et al., 2007). A sample of supergiant stars and Galactic B-type main sequence of spectral types B0.5 to B7 has been examined by using optical spectra (Thompson et al., 2007).

Fe III lines have been observed in Herbig-Haro objects (Mendez--Delgado et al., 2022; Böhm and Matt, 2001), inferred destruction of dust in shocks (Mouri and Taniguchi, 2000) and supernova remnants (Fesen and Hurford, 1996). Forbidden and fluorescent Fe III lines were also observed (Johansson et al., 2000) in the spectra of η Carinae through the Hubble Space Telescope. Emission lines among fine-structure levels of

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Regular Article

Theoretical study of atomic parameters, electron impact excitation, and photoionization of 4d and $4d^2$ states in Sn ions

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Abstract We have presented a theoretical analysis of atomic parameters such as excitation energies, lifetimes, and radiative transition parameters of Sn^{12+} ion and discussed discrepancy with theoretical and experimental results. We have also studied collisional excitation of Sn^{12+} for the lowest 9 states at six different scattered electron energies and photoionization cross sections of 4d and $4d^2$ states of Sn^{13+} and Sn^{12+} ions at five different photo-electron energies by employing distorted wave method in our computational procedure. We have provided transition data for multipole transitions. We analyzed the lifetimes of all states of Sn^{12+} and predicted that the lifetimes of $4d^2$ and $4p^5 4d^3$ states are large as compared to the lifetimes of other states.

1 Introduction

Nowadays, photolithography is the key process for semiconductor manufacturing. At present days, lithography systems with radiation of wavelength 193 nm can resolve features to 38 nm with the help of off-axis illumination and water immersion projection lenses. Extreme ultraviolet (EUV) lithography is the forthcoming step in the future in this trend which offers considerable potential to reduce the resolution of photolithography to below 10 nm. High conversion efficiency and high-energy particle are two basic requirements for EUV lithography and highly charged tin ions are the most probable candidates and atomic sources of narrow-band EUV strong transitions at 13.5 nm wavelength for future nanolithography due to their emission properties near 13.5 nm. Tin ions and neutral tin emit radiations, which have been found in several plasmas [1–15]. Many experimental investigations and techniques for generating plasmas and theoretical calculations for the study of multiply charged Sn ions plasmas have been performed. The accurate and precise spectroscopic data of Sn ions, such as excitation energies, transition data, and excitation cross sections, have significant importance for understanding the physics behind the generation, transportation of extreme ultraviolet (EUV) radiation, and the optimization of EUV sources [2, 16] as well as to diagnose and understand Sn plasmas. The highly charged ions are the emitters of photons in a narrow spectrum centered at 13.5 nm. The radiation at this wavelength is used to mark features on commercial microchips. Due to open 4d-subshell structures, Sn ions are suitable and relevant to this application. Further, the excitation energies of these configurations across Sn ions make them excellent radiators of radiation of a wavelength of 13.5 nm [17–19]. In industrial applications, Sn ions have been used in laser-produced plasmas driven by CO_2 laser of wavelength 100 Å. For understanding drive laser wavelength change for future industrial purposes, complete atomic data are necessary, and these data will also be simulation of source performance, radiation hydrodynamics codes, and emission spectra. But a very less amount of data found in the literature from obtained from theoretical calculations.

Carlson et al. [20] have computed ionization potential for elements having atomic numbers ranging from $Z = 2$ to $Z = 103$. Rodrigues et al. [21] have presented atomic binding energies of lithium to dubnium isoelectronic series by using Dirac–Fock approximation. Churilov et al. [22] have experimentally analyzed spectra of Sn and In ions including Sn^{13+} and Sn^{14+} and identified 150 spectral lines in the far VUV region having importance in projection vacuum UV lithography. Ohashi et al. [23] studied the EUV emission spectra of Sn ions from Sn^{5+} to Sn^{21+} by a collision of Sn ions with He and Xe and identified by using Hebrew University Livermore Laboratory Atomic Physics Code (HULLAC). Sasaki at el. [24] have studied the EUV emission spectra of Sn ions Sn^{5+} to Sn^{13+} by collisional radiative (CR) modeling of tin plasmas with the help of atomic parameters calculated from Hebrew University Livermore Laboratory Atomic Physics Code (HULLAC).

Recently, Liu et al. [25] have studied electron impact excitation cross sections of Sn^{13+} to Sn^{16+} by using fine-structure level distorted wave approximation. They have also included ionization and resonant excitation processes in cross sections. Windberger et al. [26] have re-evaluated the fine structure of Sn^{11+} to Sn^{14+} ions experimentally charge-state-resolved optical spectroscopy

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PAPER

Theoretical analysis of atomic parameters of Sm-like and Nd-like W ions in soft x-ray region

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Abstract

We calculated atomic data such as energy levels, transition wavelengths, oscillator strengths and transition rates for Sm-like and Nd-like W ions. We employed flexible atomic code (FAC) in our computations. We computed fine structure levels of configurations $4f^{12}5s^2$, $4f^{12}5s5p$ and $4f^{13}5s$ for Nd-like W and configurations $4f^{14}5s^2$, $4f^{13}5s^25p$ and $4f^{12}5s^25p^2$ for Sm-like W. We have provided transition data of electric dipole (E1) transitions and magnetic quadrupole (M2) transitions for transition $4f^{12}5s^2$—$4f^{12}5s5p$ and magnetic dipole (M1) and electric quadrupole (E2) transition data for transition $4f^{14}5s^2 - 4f^{12}5s^25p^2$. We also found that spectral lines of these transitions in Sm and Nd-like W ion spectra lie in soft x-ray (SXR) region. We compared transition data of Nd-like W and excitation energies of Sm-like W ions with available theoretical and experimental results. We also discussed the effect of configuration interaction on atomic data of Nd-like W and excitation energies of Sm-like W by systematically increasing the number of configurations.

1. Introduction

Tungsten has been preferred for the upcoming International Thermonuclear Experimental Reactor (ITER) [1–6]. Due to low erosion rates, low tritium retention and high radiative efficiency of tungsten ions, knowledge of atomic data of tungsten ions with charge states up to 15 + is important to check, diagnose and understood impurity fluxes and derive tungsten concentrations. Therefore, atomic properties of few times ionized tungsten ions is extremely requisite in magnetic fusion devices [7–11]. Sm-like W and Nd-like W are among the most important W ions because of the fully filled 4f and 5s orbitals in their ground state.

A very few theoretical and experimental studies on Sm and Nd-like W ions have been carried out in the past and available in literature. Carlson *et al* [12] have calculated ionization potential Sm-like W and Nd-like W. Rodrigues *et al* [13] presented total atomic binding energies for ground state configurations for Sm-like W and Nd-like W by employing Dirac-Fock approximation. Kramida *et al* [14] determine ionization energies of tungsten ions from W^{2+} to W^{71+} including Sm-like and Nd-like W ions. Beiersdorfer *et al* [15] provided ionization energies of tungsten ions including Sm-like and Nd-like W by using relativistic atomic structure code (RAC). Safronova *et al* [16] calculated excitation energies, oscillator strengths, transition probabilities and lifetimes for Sm-like ions with nuclear charge ranging from Z = 74 to 100 by using relativistic many body perturbation theory (RMBPT). They also studied contributions of 4f-core excited states by using COWAN code based on relativistic Hartree-Fock approximation. Recently, a few theoretical and experimental work on Sm-like W and Nd-like W have been performed and presented in the literature. Li *et al* [17] recorded extreme ultraviolet spectra of Sm-like and Nd-like W with the help of flat-field spectrometer installed at the Shanghai high-temperature superconducting electron-beam ion trap (EBIT). They have identified charge states and spectral transitions by using a detailed relativistic configuration interaction method and collisional-radiative model, both incorporated in the flexible atomic code. Schury *et al* [18] calculated absolute cross-sections electron impact single ionization (EISI) for multiply charged tungsten ions from W^{11+} to W^{18+} including Sm-like and Nd-like W. They have also extended their results higher energies by using sub-configuration-averaged distorted-

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Study of excitation energies of doubly excited states and identification of EUV, SXR and HXR spectral lines in M1 transitions of W LXXIII and Au LXXVIII

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ABSTRACT

We present excitation energies, wavelength of emitted photon during the transition from upper level to lower level, transitions rates and other transition parameters for doubly excited states of W LXXIII and Au LXXVIII by employing Multi-Configuration Dirac-Fock (MCDF) scheme with the inclusion of relativistic effects. We endorse that contribution of QED and Breit corrections in energies of levels is significant. We have also shown that our results of energies from both, FAC and GRASP matches with each other. We have predicted that 37 Hard X-ray (HXR), 25 Soft X-ray (SXR) and 20 Extreme Ultraviolet (EUV) magnetic dipole (M1) transitions among relativistic levels generated from doubly excited states in W LXXIII and Au LXXVIII. Further, we have studied the convergence in excitation energies and lifetime of excited states and analysed the improvement in accuracy of results by estimation of uncertainty percentage in line strength. Besides, fresh atomic data of W LXXIII and Au LXXVII which is not published in the literature have been reported and can be advantageous in diagnosis and modelling of fusion and astrophysical plasmas.

1. Introduction

The spectroscopic properties of tungsten and gold ions have become topic of interest from last few years due to its significant role in the development of magnetic fusion and radiation source. This has been proved that tungsten ions have become the most favourable candidate as an impurity material in plasma fusion reactors. Various atomic properties, namely, transition properties, collisional and photoionization data, etc, are urgent required for several ionization stages of tungsten to control the radiation loss and diagnosis of high temperature fusion plasmas. Tungsten ions are also of interest due to their exceptional thermal properties, low hydrogen retention, tensile strength which makes them first choice for plasma facing surfaces [2–6]. Consequently, several spectroscopic observational and theoretical studies on tungsten ions have been performed and some are under process from many past few years. Several measurements have been completed and under process on electron beam ion trap (EBIT) at Berlin [7–11], National Institute of Standards and Technology (NIST) [12–15], Lawrence Livermore National Laboratory (LLNL) [16–19] as well as ASDEX upgrade tokamak [20,21]. The radiations emitted from L-shell or n = 2 shell tungsten ions i.e. He-like to Ne-like ions may be useful for the calculation of ion temperature and bulk velocity of plasma.

The atomic physics is an important branch of physics which helps in describing the different states of the plasma as well as in the analysis and diagnosis of plasma properties. Since the plasmas can be in local and non-local thermodynamic equilibrium, therefore obtaining atomic properties such as atomic transition properties, energy levels and study of collisional excitation, ionization, and recombination is necessary to properly diagnose and describe high temperature plasmas.

2. Theoretical method

We have used two different fully MCDF and FAC to perform the calculations. GRASP provides configurations in LSJ as well as JJ nomenclature. The relativistic corrections, namely, Breit interactions and QED (quantum electrodynamics) corrections are also included in the calculations. For highly ionized ions, the contribution of these effects becomes prominent and therefore, their inclusion is necessary in the calculations. There are several methods have been developed for assessing accuracy of calculations. To check our results from GRASP, we

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PAPER

A comparative study of ZrS_2-based thin film solar cells using the SCAPS solar cell capacitance simulator

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Abstract

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PAPER

Computational analysis to study the effect of selenization on ZrS_2/CZTS heterostructure performance

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Abstract

Solar Cell Capacitance Simulator(SCAPS) program has been used to study JV characteristics and spectral response of ZrS_2/CZTSSe heterostructure. The proposed cell performance has also been compared with ZrS_2/CZTS and ZrS_2/CZTSe junctions. In the present study, performance parameters have been calculated by varying Se concentration with an exponential grading law in SCAPS for ZrS_2/CZTSSe heterostructure. CZTSSe bandgap can be easily tuned by varying the Se and S content. Optimized composition ratio of S/(S + Se) presented an efficiency of 16.50% and the simulated results have been interpreted for higher content ratio of 0.44. At this composition, short circuit current density, open circuit voltage and fill factor attained were 35.54 mA cm^{-2}, 0.6342 V and 73.23% respectively. The influence of layer thickness, bulk defect density, electron affinity and relative permittivity on solar cell performance parameters have also been studied.

1. Introduction

Efforts are being made by researchers for the development of low cost and efficient photovoltaic(PV) devices that can surpass the single junction Shockley–Queisser limit. Non-absorbed photons and lattice thermalization are the major loss factors that limit the device performance. Immense research is being carried out worldwide to obtain efficient solar cell junction [1]. Over the past few decades thin film technology based on materials like a-Si, CdTe and CIGS have evolved in this area and are of great interest for scientific community [2]. Since devices with a-Si as absorber layer are costly and have low throughput due to lack of ordered arrangement of silicon atoms, first generation c-Si still dominates the PV commercial market [3]. CdTe [4] and CIGS [5] based solar cells fabricated using low cost deposition techniques offer highly efficient solar cells with conversion efficiencies of ~21% and ~23% respectively [6]. Discharge of toxic element(Cd) in the environment and rare metal reserves (Te,In) have put an impact on large scale production of CdTe and CIGS based thin film solar cells. In order to overcome these shortcomings scientists are exploring new low cost and environment friendly materials. Recent studies have reported that junctions made with kesterites such as CZTS, CZTSe and CZTSSe have potential to replace existing thin film solar cell materials [7–9]. Their exciting properties such as high absorption coefficient and tuneable band gap promise to achieve a goal of high efficiency in near future [10–14]. Record efficiency of 12.6% has been reported for CZTSSe solar cell [15]. Efforts are being made by researchers to bridge the performance gap between kesterites and CIGS based solar cells to improve the output power for economically viable optoelectronic applications.

The numerical simulations using SCAPS-1D have been performed to investigate the performance of ZrS_2/CZTSSe heterojunction under AM1.5 illumination conditions at 300 K. CZTS is a quaternary semiconductor with optical bandgap of 1.5 eV [11], close to the single junction requirement which makes it a promising absorber material for PV applications. The bandgap can be further reduced by alloying it with its Se

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Investigating the effects of bismuth doping on the structural, optical, and electrical properties of Cu_2ZnSnS_4 thin films for photovoltaic applications

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ABSTRACT

The undoped and bismuth-doped Cu_2ZnSnS_4 (CZTS) thin films were fabricated by an inexpensive sol–gel spin-coating method followed by the sulfurization process. The aim of this work is to study the role of bismuth incorporation on the structural, optical, and electrical properties of CZTS films. The films exhibit polycrystalline nature in kesterite structure along (112) plane with improved crystallite size. The A_1 mode of CZTS films was found to be red shifted in the Raman spectra. The study between physical properties and surface morphology of films was evaluated using AFM-based power spectral density analysis. The optical studies revealed the decrease in bandgap energy of CZTS film from 1.55 to 1.24 eV with increasing doping concentration. The Hall measurement confirmed the p-type nature of films and mobility significantly enhanced for the doped films. The increase in photosensitivity response of the bismuth-doped CZTS films suggests their suitable application as absorber layer in the solar cell.

1 Introduction

Cu_2ZnSnS_4 (CZTS) has recently attracted a great deal of attention because of its ideal features like direct energy gap (~ 1.4 to 1.5 eV) with high absorption coefficient value more than 10^4 cm^{-1} and easily available low-cost constituents [1]. Wang et al. [2] have reported 12.6% as the maximum power conversion efficiency by hydrazine solution processed CZTS, Se photovoltaic cell at a laboratory scale. In general, the thin films of CZTS materials are fabricated by vacuum techniques such as co-evaporation [3] and sputtering methods [4]. These methods require accurate control on the flux of elements during fabrication process. Moreover, the use of hydrogen sulfide gas in the sputtering routes and overpressure issues of sulfur in the co-evaporation deposition method makes all such process cumbersome [5]. Therefore, in contrast to these drawbacks of the vacuum process, various non-vacuum based

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Article

Enhancing Photocatalytic Efficiency of Spent Tea Leaf Powder on $ZnIn_2S_4$ Incorporation: Role of Surface Charge on Dye Degradation

Mool Chand, Swapnil Barthwal, Arun Singh Rawat, Manika Khanuja,* and Seema Rawat

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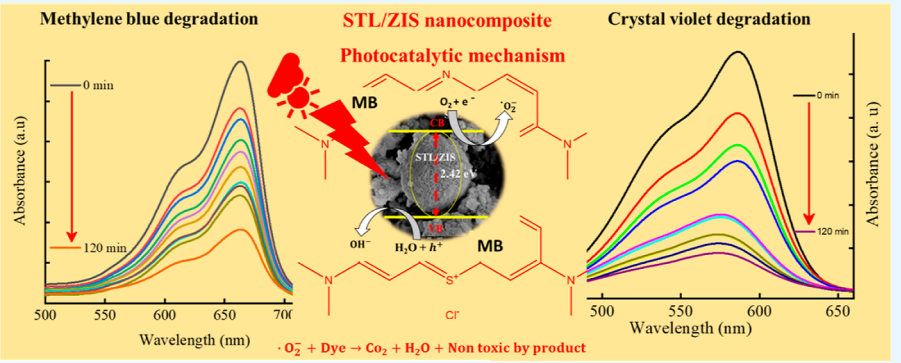

ABSTRACT: Photocatalytic degradation of dye contaminants using nanocomposite adsorbents has emerged as a promising solution for wastewater treatment. Owing to its abundant availability, eco-friendly composition, biocompatibility, and strong adsorption activity, spent tea leaf (STL) powder has been extensively explored as a viable dye-adsorbent material. In this work, we report spectacular enhancement in the dye-degradation properties of STL powder on incorporation of $ZnIn_2S_4$ (ZIS). The STL/ZIS composite was synthesized using a novel, benign, and scalable aqueous chemical solution method. Comparative degradation and reaction kinetics studies were performed onto an anionic dye, Congo red (CR), and two cationic dyes, Methylene blue (MB) and Crystal violet (CV). The degradation efficiencies of CR, MB, and CV dyes were obtained to be 77.18, 91.29, and 85.36%, respectively, using the STL/ZIS (30%) composite sample after the 120 min experiment. The spectacular improvement in the degradation efficiency of the composite was attributed to its slower charge transfer resistance (as concluded by the EIS study) and optimized surface charge (as concluded by ζ potential study). Scavenger tests and reusability tests deciphered the active species ($^{\bullet}O_2^-$) and reusability of the composite samples, respectively. To the best of our knowledge, this is the first report to demonstrate improvement in the degradation efficiency of STL powder on ZIS incorporation.

1. INTRODUCTION

Available freshwater amounts to less than 0.5% of all the water on earth, while its global consumption is doubling every 20 years.[1−3] To ensure perpetuated water supply, wastewater must be recycled. Organic (synthetic) dyes are integral components of wastewater, and these materials have low biodegradability and cause contamination of the land and water bodies.[4−6] Weathering of organic dyes via oxidation, hydrolysis, and other chemical reactions (occurring in the wastewater phase) generates toxic metabolites that impart adverse effects on the biological system.[7,8] Dye molecules are carcinogenic and hazardous to human health and marine organisms, even at low concentrations. Allergic dermatitis, skin allergy, and dysfunction of the sex organs, kidney, brain, liver, and so forth are caused by toxic dye molecules.[9−13] Advanced heterogeneous photocatalysis, employing semiconductor photocatalysts is a promising technology to degrade these contaminants. Semiconductor-mediated photocatalysis is an emerging sustainable technology, utilizing the solar insolation to activate the chemical reactions occurring at the surface of semiconductor catalysts.[14−16] This technique mineralizes a broad range of organic dyes into harmless byproducts such as CO_2, H_2O, and inorganic ions.[17−20]

Tea is the second most consumed beverage in the world, only behind water. Spent tea leaves (STLs) are therefore available as an abundant solid waste.[21,22] This material has been widely explored as a non-conventional and inexpensive adsorbent for the water contaminants (such as synthetic dyes), arsenic,

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considerable influence of superoxide radical ($^{\bullet}O_2^-$) on a photocatalytic experiment for both CV and MB dyes.

5.3. Photocatalytic Mechanism. Figure 12 illustrates the mechanism of photocatalytic dye degradation in the STL/ZIS

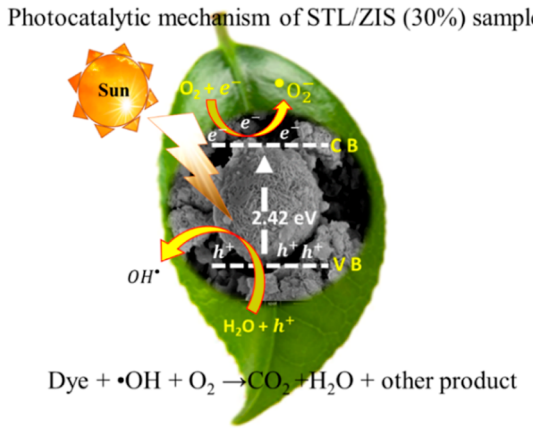

Figure 12. Schematic of photocatalytic mechanism of the STL/ZIS (30%) composite.

composite. During the photocatalytic process, when light with energy greater than the band gap of the photocatalyst sample is applied, an electron−hole pair is created. The holes in the conduction band react with the H_2O molecule, producing the hydroxyl ($^{\bullet}OH$) radical and (h^+) ion as depicted in eqs 7−9.

$$STL/ZIS + hv \rightarrow STL/ZIS\ (e_{cb}^- + h_{vb}^+) \quad (7)$$

$$H_2O \rightarrow OH^- + H^+ \quad (8)$$

$$OH^- + h^+ \rightarrow {}^{\bullet}OH \quad (9)$$

Similarly, conduction band electron (e^-) reacts with oxygen radical (O_2) are produced superoxide radicle ($^{\bullet}O_2^-$). These radicals react with dye molecule and transform them into less harmful, nontoxic byproducts as given in eqs 10 and 11.

$$e_{cb}^- + O_2 \rightarrow {}^{\bullet}O_2^- \quad (10)$$

$$^{\bullet}O_2^- + \text{dye} \rightarrow \text{Non toxic byproduct} \quad (11)$$

5.4. Recyclability Test. Reusability of the STL/ZIS (10%) composite sample was investigated on the CV dye (1 mg/100 mL), using 10 mg of composite sample, for five cycles, as shown in Figure 13. In the first cycle, the composite induced 83.98% dye degradation. Next, the photocatalytic reduction solution was filtered, washed, and dried. The cleansed samples were again employed for the reduction of fresh CV solution and the

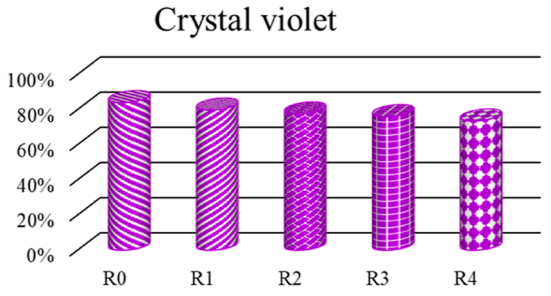

Figure 13. Recyclability plot of the STL/ZIS (10%) composite for the degradation of CV dye during five cycles.

photocatalysis efficiency was noted. The experiment was performed for five cycles and the photocatalysis efficiency slightly decreased from 83.98 to 73.54% after the fifth cycle. This slight change can be attributed to the photocatalyst waste after each cycle. The recyclability test clearly illustrates that the tea leaves composite (STL/ZIS) retained its dye degradation activity even after five cycles, thus emerging as excellent candidates for reusable adsorbent for dyes.

6. CONCLUSIONS

In this work, we report the synthesis of the STL/ZIS composite using an aqueous chemical solution method and performed in-depth investigation of comparative dye degradation activity of anionic dye (CR) and cationic dyes (MB and CV). XRD, FESEM, and HRTEM results were consistent in confirming the hexagonal phase of ZIS, with ZIS microspheres incorporated into the STL matrix. The element composition and oxidation state of the composite were confirmed by XPS.[66−72]

All composites STL/ZIS were found far efficient than the pristine STL powder sample, in degradation of cationic and anionic dyes and STL/ZIS (30%) sample shows the superior degradation efficiency ($\eta_{CR} \sim 77.18$, $\eta_{MB} \sim 85.36$, and $\eta_{CV} \sim 91.29$, in 120 min). Significant enhancement in photocatalytic degradation efficiency attributed to visible light response (as confirmed by tauc's plot), optimized surface charge (as observed from ζ potential), and low charge transfer resistance as observed from EIS study. Reaction kinetics was found to follow the second-order kinetic model, and the overall adsorption process is dominated by the chemisorption process. Photocatalysis mechanism along with trapping experiment was well explained. Reusability of the materials were also examined and samples demonstrated reusable properties up to five cycles. Spectacular improvement in dye-degradation efficiency of STL powder was demonstrated on ZIS incorporation. The study demonstrates that the STL/ZIS composite might be employed as an efficient, inexpensive, and eco-friendly photocatalyst for the dye degradation and wastewater treatment applications.

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PAPER

A comparative photocatalytic degradation study of cationic and anionic dyes using $ZnIn_2S_4$ photocatalyst

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Abstract

Semiconductor mediated photocatalysis has emerged as a promising solution for dye degradation and environmental remediation. Zinc Indium Sulfide ($ZnIn_2S_4$, ZIS) is a benign

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Effect of $BaTiO_3$ Doping on the Vibrational Properties of PAni

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Abstract
Due to the advantages of material abundance and synthetic simplicity, polyaniline can be used as a high-capacity cathode material. However, its practical application in batteries has been hindered by poor electrochemical utilization and cycling instability. This paper reports the enhancement in the conductivity of the polymer (PAni) using the oxidation polymerization method. After successfully synthesis of PAni the vibrational properties have been analyzed by using FTIR. From experimental data, it has been observed that after doping of $BaTiO_3$ the carriers along the surface enhanced which increases vibration along with the fingerprint reason. The polymers showed less electrical conductivity than polyaniline. Unlike polyaniline, the presence of the nitro group caused higher frequency dependence of electrical conductivity. The FTIR bands at 1492, 1291 and 1147 cm^{-1} are corresponding to the polyaniline salt.

Keywords- Polymerization, FTIR, Conductivity.

1. Introduction

There is an explosive increase in the demand for composite materials in the last two decades, which are now available as materials with a unique combination of properties (Xu et al., 2013) Polyaniline (PAni) has been at the forefront of the global search for commercially viable conducting polymers because of its unique proton dopability, excellent redox recyclability, chemical stability, variable electrical conductivity (which can be varied by changing the pH at which it is prepared), low cost and ease of synthesis (Ram et al., 2020; Thomas et al., 2017; Tang et al., 2017). Thus, the composites based on conducting polymers

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Regular Article

Quaternion supersymmetric quantum mechanics and SWKB approximation

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Abstract A theory of quaternionic supersymmetric quantum mechanics has been developed in terms of quaternion supercharges, superpartner Hamiltonian and energy eigenvalues. We have obtained higher-order Hamiltonians with the help of lowering/raising quaternion operators and superpartner Hamiltonians, so one can arrive at higher-dimensional theories from lower dimensions by using this technique. It has been shown that partner Hamiltonians contain many terms which can indicate the presence of an extra particle, dark matter, or any unanswered physics phenomenon. Supersymmetric WKB approximation has also been tested in the quaternion space for superpotentials V_+ and V_-, and it is concluded that the SWKB quantization condition in quaternion space is not exact and is slightly different from the usual SWKB quantization condition.

Abbreviations

SUSY	Supersymmetry
SWKB	Supersymmetric Wentzel–Kramers–Brillouin approximation
QSWKB	Quaternionic supersymmteric WKB approximation

1 Introduction

Quaternionic quantum mechanics provides a better version of the standard quantum mechanics. It is a generalized theory where real and complex quantum mechanics are the special cases as quaternions are the extensions of complex numbers but differ in a way that their multiplication is noncommutative. Pearle [1] showed that complex quantum mechanics is an asymptotic case of quaternionic quantum mechanics. Quaternionic quantum mechanics was extensively studied by Adler [2] and Das [3]. During the last two decades, quaternions have gained enormous popularity because of their following unique properties.

1) They provide homogeneous four-dimensional structure to relativistic quantum mechanics [4–6].
2) They automatically incorporate spin due to their representation in terms of Pauli spin matrices; hence, they are suitable for nonzero spin particles [7, 8].
3) Quaternions provide compact representations suitable for use in higher-dimensional quantum field theories.
4) The difficulty faced by the Schrodinger equation that includes imaginary i is also overcome by reformulating it in terms of quaternions [2].

Abovementioned unique features of quaternions motivated several authors to use them in gauge theories [9, 10], in quantum mechanics by Leo et. al. [11, 12], Ulrich [13], Chanyal [14], Hasnabadi [15] in standard model [16]. A new aspect of quaternionic quantum mechanics was introduced by taking the Hermitian nature of Hamiltonian [15–18].

Supersymmetry on the other hand is the unifying theory for bosons and fermions where each bosonic particle has its fermionic partner. SUSY provides the underlying structure for grand unified theories [19], and supersymmetric quantum mechanics is described in terms of pairs of Hamiltonians called superpartner Hamiltonians, superpartner potentials, and supercharges. Supersymmetric quantum mechanics was developed by Witten [20] and was further extensively studied by Das and Cooper [21, 22].

In this paper, we attempted to develop supersymmetric quantum mechanics in terms of quaternion operators and we have obtained the expressions for superpartner Hamiltonian, superpotentials, supercharges, and energy eigenvalues. Supercharges convert the bosonic state (H_+) to the fermionic state (H_-) and vice versa. With the help of these operators, we can obtain higher-order Hamiltonians from lower-order Hamiltonians.

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Hydrogen production activity of MoS_2-$ZnIn_2S_4$ nanocomposite under visible light irradiation

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Abstract

In this manuscript, we report the synthesis of MoS_2-$ZnIn_2S_4$ nanocomposite by using methods including hydrothermal and chemical aqueous method under low temperature. The prepared MoS_2-$ZnIn_2S_4$ composite sample was characterized

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Analogue and structure based approaches for modelling HIV-1 integrase inhibitors

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Abstract

A set of 220 inhibitors belonging to different structure classes and having HIV-1 integrase activity were collected along with their experimental pIC_{50} values. Geometries of all the inhibitors were fully optimized using B3LYP/6-31 + G(d) level of theory. These ligands were docked against 4 different HIV-1 integrase receptors (PDB IDs: 4LH5, 5KRS, 3ZSQ and 3ZSV). 30 docked poses were generated for all 220 inhibitors and ligand interaction of the first docked pose and the docked pose with the highest score were analysed. Residue GLU170 of 4LH5 receptor shows the highest number of interactions followed by ALA169, GLN168, HIS171 and ASP167 residues. Hydrogen bonding and stacking are mainly responsible for the interactions of these inhibitors with the receptor. We performed Molecular Dynamics (MD) simulation to observe the root-mean-square deviation (RMSD), for measure the average change of displacement between the atoms for a particular frame with respect to a reference and The Root Mean Square Fluctuation (RMSF) for characterization of local changes along the protein chain of the docked complexes. Analogue based models were generated to predict the pIC_{50} values for integrase inhibitors using various types of descriptors such as constitutional, geometrical, topological, quantum chemical and docking based descriptors. The best models were selected on the basis of statistical parameters and were validated by training and test set division. A few new inhibitors were designed on the basis of structure activity relationship and their pIC_{50} values were predicted using the generated models. All the designed new inhibitors a very high potential and may be used as potent inhibitors of HIV integrase. These models may be useful for further design and development of new and potent HIV integrase inhibitors.Communicated by Ramaswamy H. Sarma.

Keywords: Molecular docking; analogue based modelling; density functional theory; molecular dynamics simulation; quantitative structure activity relationship.

Research Article

Impact of Covid-19 Vaccination on Menstrual Health in Indian Females

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ABSTRACT

Menstrual cycle is an important aspect in human female's life and may have minor variations; major variations are manifestations of severe physiological/psychological disturbances and may need intervention. Continuous outbreak of microbial/viral infections is hampering health and to combat there is regular development of vaccines; which may affect menstrual cycle adversely. Amidst Covid-19 pandemic, a global vaccination drive is underway to secure public health. The study aims to understand the correlation between Covid-19 vaccination and menstrual health through cross-sectional online survey in 1260 Indian females. Results suggested that no adverse changes/symptoms were reported by the participants in their menstrual health post-Covid-19 vaccination and therefore no hesitation must be made by females for Covid-19 vaccination.

Keywords: Menstrual cycle, Menstrual irregularities, Pandemic, Covid-19, Vaccination.

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INTRODUCTION

Female reproductive health has become a matter of concern globally in the last decade and menstrual parameters are one of the primary indications of female reproductive health & general wellbeing. It has been studied, that various disorders and irregularities are associated with menstruation like menorrhagia (heavy bleeding), metrorrhagia/polymenorrhagia (frequent bleeding), dysmenorrhea (cramps and pelvic pain), worsened PMS (premenstrual syndrome), post-menopausal bleeding are not only the indicators of reproductive issues but they also affect the mental health and quality of life.[1] Menstrual cycle is affected by many factors including stress, weight gain/loss, hormone, stress, depression, sleep disturbances, physical stress etc.[2] Also, the hypothalamic-pituitary-gonadal axis is very sensitive to persistent stress and manifests as irregular or disturbed menstrual cycle.[2,3] Viral infections like HBV (Hepatitis B virus) or HCV (Hepatitis C virus) are reported to be associated with menstrual disorders, reproductive complications like pregnancy loss and infertility.[4] Also, viral infections are known to affect the immune system of the host and lead to increase in interleukins (IL), tumour necrosis factor (TNF) and various cytokines thus causing stress and ultimately lead to hormonal disturbances.[5] Covid-19 is caused by SARS-CoV-2 (Severe acute respiratory syndrome Coronavirus 2) and amidst pandemic there are various reports mentioning that it affects multiple aspects of menstruation, primarily by increased psychological stress and thus disturbing hypothalamic-pituitary axis.[2,6]

It has been reported that 25% of studied females had varied menstrual volume during Covid-19 infection.[7] McNamara 2020, reported that during the pandemic, 20% of female athletes experienced changes in length of menstrual cycles and could be a result of psychological stress.[8] Although, there is no clinical data available on the impact of the same on ovarian functions directly.[4,7] The, World Health Organization (WHO) has issued various guidelines at regular intervals to contain the spread of Sars-CoV-2 virus, which includes wearing masks, social distancing, use of well-ventilated spaces, maintaining hygiene, healthy lifestyle, and vaccination. Vaccination is known to be the most cost-effective life-saving method against various viral and microbial infections by eliciting immune responses.[5,9] Also, to end the coronavirus pandemic, vaccination remains the single most effective means to reduce fatalities and severe illness. However, it has been reported that Covid-19 vaccine administration may cause haemorrhage, blood clots and thrombocytopenia with pre-existing coagulation disorders or with certain medications.[10] Still, the benefits of vaccination outweigh the minuscule risks/side effects associated with vaccination. Apart from the scientific point of view, there is a lot of vaccine hesitancy in people especially in developing countries like India. People have different myths like vaccination can lead to death, male or female infertility etc.

Therefore, it is of utmost importance to survey and generate data about the impact of vaccination on various

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A Study on Spread & Symptoms of COVID-19 in India

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ABSTRACT

The SARS-CoV-2 virus is a non-segmented positive sense, single-stranded RNA virus which originated as a mysterious virus causing a pneumonia-like outbreak in China and has caused widespread havoc all across the world since 2020. Ever since then researchers have carried out extensive research to study its genomic sequences, develop new vaccines for its treatment to prevent the spread of this virus and help us return to normalcy. However, till now the virus has undergone several mutations to evolve into new strains with increased transmissibility. In this study, we have analyzed the spread and symptoms of COVID-19 in India. We conducted an online survey through google forms to analyze the spread and symptoms of COVID-19 in India during first two waves. Out of the total response received, 47.0% were infected with COVID-19. Common symptoms experienced by the respondents were fever and fatigue, headache, loss of taste or smell and muscle or joint pain. Out of the total infected people, 25.31% of them reported having an underlying medical condition, diabetes being most common. The majority of COVID-19 positive patients were infected during the peak of the second wave. Most people experienced mild to moderate symptoms. However, people with comorbidities showed a higher incidence of moderate to severe symptoms and they took longer to recover. Many respondents also mentioned a negative impact on their mental health due to COVID-19.

Keywords: SARS-CoV-2, Pandemic, India, Survey, First wave, Second wave.

INTRODUCTION

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was first detected in late December 2019 in Wuhan, China. On studying the genomic sequence of samples isolated from the lower respiratory tract of patients, the World Health Organization (WHO) identified the virus as a novel coronavirus and named the disease as COVID-19. The SARS-CoV-2 virus, belonging to the genera Beta corona virus, is the third major outbreak from this genus after SARS-CoV (2002) and MERS-CoV (2012). Coronaviruses possess a positive, single-stranded RNA genome along with crown-like protein spikes on their viral surface which contains the variable receptor binding domain (RBD). This domain allows the virus to bind to the Angiotensin-Converting Enzyme-2 (ACE2) receptor found in host cells [1,2]. They mainly cause respiratory infections with symptoms ranging from mild fever and fatigue to severe acute respiratory distress syndrome (ARDS), respiratory failure or death. The SARS-CoV-2 virus is suspected to have a zoonotic origin and shows community transmission from human to human via respiratory droplets (airborne transmission) or close contact with the infected patient [3]. It has been observed that the transmission rate of SARS-CoV-2 is higher, due to its higher binding affinity to the ACE2 receptor in the host cells.It is believed that SARS-CoV-2 has a bat origin since the genome of SARS-CoV-2 is 96.2% similar to a coronavirus found in bats-BatCoV RaTG13 [4]. Furthermore, SARS-CoV-2 also shares a 93.3% sequence identity with another bat coronavirus-RmYN02[5]. In comparison, SARS-CoV-2 has only 79.5% sequence identity with SARS-CoV, and 50% sequence identity with MERS-CoV[6]. The Receptor Binding Domain (RBD) of Spike (S) protein of SARS-CoV-2 showed a 73.7% sequence identity with SARS-CoV whereas it showed a 93.1% sequence identity with BatCoV-RaTG13, hence suggesting that SARS-CoV-2 is different from previous existing Human Coronaviruses [4,6]. Owing to spread of SARS-CoV-2 virus and severity of disease caused by it, on 11th March 2020, WHO declared COVID-19 as a pandemic [2].

In India, the first case of COVID-19 was discovered on 30th January 2020 from Kerala. Various other states also started reporting Covid cases in international travelers. From March 2020 onwards, there was an exponential increase in the daily number of positive cases in India. On 18th March, 2020 the National Task Force (NTF) on COVID-19 was established, followed by the declaration of the first nationwide lockdown on 24th March 2020 with only 499 active cases in the country at that time. The initial lockdown was followed by several more lockdowns [7]. The first wave of COVID-19 in India hit its first peak in September 2020 with around 100,000 daily cases and Second wave had peaked in May 2021.

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A Bibliometric and Cluster Analysis of the Adoption of Wearable Fitness Device

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Abstract
Wearable fitness devices are used to track routine health data like calories burned, steps walked, heart rate, and sleep pattern of users, and hence, they are considered an important tool for health management. The present study systematically reviews the existing literature in the domain of wearable fitness device adoption for the past decade and presents a bibliometric and cluster analysis. The paper begins with the methodology adopted followed by Bibliometric and Cluster analysis and finally,a conclusion is drawn and the future scope of research is recommended. We included articles published in Scopus and Web of Science-indexed journals.
Keywords: smart watches, health management

Introduction

The use of Wearable fitness devices has increased manifold in the last decade. Wearable fitness devices or smartwatches use sensors to generate health-relatedinformation about the user when attached to the body, usually the wrist. These wrist-worn devices are used to track routine health data like calories burned, steps walked, heart rate, and sleep pattern of users and therefore, they are considered an important tool for health management. The global smartwatch market was worth USD48.44 billion in 2020 and is expected to reach USD 130.92 billion by 2025 with a compound annual growth rate of approximately 18.32% (Market Data Forecast, 2020). The devices are used for varied reasons by consumers of different age groups. Originally designed for health management, these devices are now used for sharing location, status symbols, gaming, and VR experience also. The multiplicity of uses and increasing health concerns have created a big market for these devices and developers are continuously adding innovative features and improving user interface to meet the increasing demands.

Older adults use wearable fitness devices for their healthcare and alert functions (Yu-Huei, Ja-Shen, & Ming- Chao, 2019), their (in particular elderly diabetic patients) usage behavior is positively influenced by Perceived usefulness, Perceived ease of use, perceived Irreplaceability, perceived Credibility, Compatibility and social influence (Ahmad, Rasul, Yousaf, & Zaman, 2020). However, technology anxiety and resistance to change demotivates them to use these devices (Talukder, Sorwar, Bao, Ahmed, & Palash, 2020).

Over the past few years, most studies on smartwatches have focused on how they can be used for various purposes (design, health, etc.) and have applied exactly the determinants from prior theories (e.g. TAM) to explain their adoption (Choi& Kim 2016). Similarly, many other

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Stability analysis of Lagrangian points of geo-synchronous satellite including the resistive force and earth's equatorial ellipticity

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Abstract

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Unveiling the Attracting Regions in Photogravitational Four-Body Problem Including the Effect of Asteroids Belts

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Abstract—The restricted four-body problem including the effect of solar radiation pressure (q) and the asteroids belt (M_b) is considered for this work. One aspect of this work is to explore the existence and evolution of equilibrium points in some predefined interval of the parameters. For the given range of parameters, there exists either six, eight, ten or twelve equilibrium points. Examining the stability of equilibrium points and the zero-velocity curves is another aspect of this work. For all cases, the equilibrium points are found to be unstable. The bi-variate Newton–Raphson (N–R) scheme is used to unveil the basins of convergence (BoCs) linked to equilibrium points under the effect of parameters μ, q, and M_b. A uniform grid of approximately one million initial conditions on the xy-configuration plane are considered to give a complete shape to BoCs. Iteration–Intensity graphs are drawn to explain the link between the number of iterations required to achieve the predefined accuracy of order 10^{-15} and the position of initial conditions. Pie-charts are used to determine the number of iterations of N–R scheme, after which the maximum number of initial conditions converge. The method of basin entropy is applied to explore the effect of parameters on the existence of unpredictable regions of BoCs (known as fractal), particularly along the boundaries. We observe fractal boundaries of BoCs, fractal BoCs and non-fractal BoCs for the given range of parameters.

Keywords: radiation pressure, Newton–Raphson (N–R) method, basins of Convergence (BoCs), basin entropy, fractal

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1. INTRODUCTION

The Circular Restricted Four body problem (CR4BP) is an emerging area of interest in celestial mechanics and has gained the attention of scholars working in this field because of its application in Astrophysics, Astrodynamics and spacemechanics. In CR4BP, we have three masses (called primaries) rotating in circular orbit under the influence of their mutual gravitational forces and we study the motion of the fourth mass (called infinitesimal) which moves under the influence of gravitational forces of primaries but is not influencing their motion. Several authors have studied the existence and stability of equilibrium points in CR4BP (e.g., [1–4]). In the present work, we have studied the effect of asteroids belt and radiation pressure in CR4BP.

The effect of asteroids belt/circular cluster of material points/circumstellar dust on the restricted 3-body problem has been studied by various scholars [5–8]. In 2015, Falaye studied the effect of circular cluster of material points in R4BP including the effect of oblateness and radiation pressure [9]. Jagdish Singh and others [10] have investigated the impact of circumstellar dust on the motion of infinitesimal body in Manev's field. There, he studied the existence and stability of equilibrium points under the effect of Manev parameter. The basins of convergence (attracting regions) for equilibrium points has been studied briefly and there is scope for a thorough study of basins of convergence and basin entropy. Recently, Mahato and others [11] have studied the effect of asteroids belt on the restricted (2+2)-body problem. It has been noted from the above works that circular cluster of dust particles has considerable impact on the dynamical system.

In a dynamical system, the study of basins of convergence/attraction (BoCs) of an equilibrium point (attractor) is imperative because the domain of convergence provides useful information about the qualitative properties of the system. Flow of water near any obstacle can be described using basins of convergence [12]. We use Newton–Raphson (N–R) iterative scheme for obtaining the basins of convergence. Douskos [13] used the N–R iterative scheme to study the BoCs in Hill's problem including radiation pres-

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AN EFFICIENT HAAR WAVELET SERIES METHOD TO SOLVE HIGHER-ORDER MULTI-PANTOGRAPH EQUATIONS ARISING IN ELECTRODYNAMICS

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Abstract. The primary aim of this paper is to develop a numerical method based on Haar wavelets for solving second and higher-order multi-pantograph differential equations. This method transforms the differential equation into a system of algebraic equations with undetermined coefficients. These algebraic systems can be solved either by Newton's or Broyden's iterative methods. Finally, few test examples are taken from the literature to show the computational efficiency of this method.

1. Introduction

Delay differential equations appeared in the mathematical modeling of many real-world processes. It has enormous applications in many fields such as probability theory, number theory, chemical, and biological processes, population and economic growth modeling, etc. Functional-differential equation with proportional delay is known as pantograph equation or generalized pantograph equation. The name pantograph first appeared in 1851 and was a device used in the construction of the electric locomotive. The mathematical model of pantograph was first developed by Ockendon and Tyler [19]. Pantograph equation is one of the most distinguished delay differential equation and has been an interest of many researchers [5, 9, 10]. The pantograph differential equations are encountered in studies of population dynamic model, quantum theory, control theory, cell growth model, disease spread model and

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Key words and phrases. Pantograph equations; Delay Ordinary Differential Equation; Numerical method; Collocation points; Haar wavelets.

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Haar wavelet based numerical method for solving proportional delay variant of Dirichlet boundary value problems

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Abstract

In this paper, We studied an application of the Haar wavelet basis in solving a particular class of delay differential equations. We have extended the Haar wavelet series(HWS) method to develop a numerical technique to solve linear and nonlinear Dirichlet boundary value problems of proportional delay nature. Some problems are presented to test the efficiency of the proposed technique, where a remarkable agreement between approximate and analytic solutions is obtained. The numerical simulation indicates that error drops with the increase in the level of resolution. Also, it is observed that the rate of convergence tends to be 2.

Keywords: Delay differential equation, Dirichlet boundary Condition, Haar wavelet
2020 MSC: 34B05, 34B15, 65L03, 65Q20, 65T60

1 Introduction

Differential equations play a decisive role in the mathematical modeling of plentiful real-life phenomena. They have been proven as an efficient tool to accurately capture the behavior of the models where the system's current state determines the system's future behavior. Such models are called deterministic models. Several authors have investigated different aspects and applications of ordinary and fractional differential equations [13, 18, 28, 38, 39, 40, 41, 42]. In many real-time models, consistency plays an important role and can be improved by incorporating delay terms in its modeling. When delay terms are included in the differential model, a new class of differential equations is known as delay differential equations or functional differential equations. A delay differential equation is an evolutionary system in which the rate of change of a time-dependent process is defined by the current state of the system and a specific past state. The theory of delay differential equations has drawn the interest of several mathematicians and physicists. These equations are frequently used in the simulation of many real-life events, and they have proven to be more accurate in the simulation of natural phenomena. These equations are used in a wide range of disciplines, including industry, biological processes, chemical kinetics, electronics and transportation systems, ship navigational control, infectious diseases, and population dynamics [6, 16, 20, 23, 43].

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ESTIMATION OF PARAMETERS AND STABILITY ANALYSIS OF CORONAVIRUS PANDEMIC

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Simple and Efficient Group Key Distribution Protocol using Matrices

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ABSTRACT

Group Key Distribution (GKD) protocols are designed to distribute a group key to several users for establishing a secure communication over a public network. The central trusted authority, called the key distribution center (KDC) is in charge of distributing the group keys. For securing the communication, all the users share a common secret key in advance with KDC. In this paper, we propose a secure and efficient Group Authenticated Key Distribution (GAKD) protocol based on the simple idea of encryption in matrix rings. In this protocol, each user registers in private with the KDC, while all the other information can be transferred publicly. The scheme also supports authentication of group keys without assuming computational hard problems such as Integer Factorization Problem (IFP).

The analysis of our GAKD protocol shows that the proposed protocol is resistant to reply, passive and impersonation attacks. Our construction leads to a secure, cost and computation- effective GAKD protocol.

Keywords: Group key distribution protocols; Matrices; Group communications

1. INTRODUCTION

The basic condition for secure group communications over public channels is that all group users should agree on a common secret key. Group Key Exchange (GKE) protocol is the most basic component of group communications where the fundamental goal is to establish a common secret key (group key) in a way that no one other than the group members can obtain the group key. The objective of group key exchange protocol with authentication is to establish a secret group key between the legitimate group members who can verify the authenticity of the shared key. This secret group key (session key) is used to facilitate secure communication services such as confidentiality, authentication, data integrity, etc.

Most of the popular group key protocols are divided into two categories: (1) Group Key Exchange (GKE) protocols: there is no explicit KDC and all communicating parties interactively determine the session keys and (2) Centralized Group Key Distribution (GKD) protocols, where a Key Distribution Center (KDC) is in charge of managing the entire group from selecting session keys to transporting these secretly to all communicating entities. The most famous key exchange protocol is Diffie–Hellman key agreement protocol[12] which can provide session keys for only two entities. Various attempts have been made for extending the 2-party Diffie-Hellman key agreement protocol to its multi-party variant.[13,1,7]

Centralized group key distribution protocols are widely used due to their efficiency in implementation. Guo,[3] *et al.*also proposed a GAKD protocol based on the generalized Chinese remainder theorem. Zheng,[16] *et al.*proposed two variations for centralized key distribution protocols named Fast Chinese Remaindering Group Key and Chinese Remaindering Group Key. Shamir's secret sharing has also been used to design group key distribution protocols.[5,9,15] For example, Harn-Lin[5] and Liu,[8] *et al.* proposed authenticated group key transfer protocols where they use the IFP to resist insider attacks. Meng, *et al*.[9] in have also proposed a GKD protocol which is based on a secret sharing scheme by Shamir but the security of their protocol does not rely on any computational hard problem. There are several research articles where the construction and analysis of group key protocols are discussed.[6,11-12]

In the protocols proposed in,[5,8-9] one-way hash functions are computed by users to authenticate the session key. The KDC publishes the hash value of the session key in advance, which is used to verify the authenticity of the group key. Recently we have also worked on cryptographic protocols which are based on matrices over rings[4,10].

On the other hand, there are some limitations of these protocols: some cryptographic algorithms assume the hardness of mathematical problems, many need a vast number of operations and there are some which cannot prevent reply attacks. Several protocols have been proposed in past years but most of these are deficient in terms of the communication overhead, computational complexity, storage complexity, and a large number of users. Thus, it is essential to design a Group Authenticated Key Distribution (GAKD) protocol, which has the ability to overpower the above weaknesses.

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On Some Pexider Type Sum Form Functional Equations

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Abstract

Since its genesis, an equation of Pexider type has captivated the attention of the mathematical fraternity around the world. Over the decades, several Pexiderized forms of various functional equations have been studied meticulously. In comparison to the functional equations, such forms are less analysed for sum form functional equations and require substantial study. Taking lead from it, this paper is devoted to obtain the general solution of some Pexiderized forms of a sum form functional equation

$$\sum_{i=1}^{n}\sum_{j=1}^{m} T\left(p_i q_j\right)=\sum_{i=1}^{n} T\left(p_i\right)\sum_{j=1}^{m} T\left(q_j\right)+(m-n)T(0)\sum_{j=1}^{m} T\left(q_j\right)+m(n-1)T(0),$$

where T is a real-valued mapping with the domain $I = [0,1]$; $(p_1,\ldots,p_n) \in \Gamma_n$, $(q_1,\ldots,q_m) \in \Gamma_m$ and $n \geq 3$, $m \geq 3$ are fixed integers.

Keywords: Pexider's equation, Sum form functional equation, Additive mapping, Multiplicative mapping, Entropy

2010 MSC: 39B52, 39B82

1. Introduction

Throughout this paper, $\mathbb{N}$ denotes the set of positive integers; $\mathbb{R}$ denotes the set of real numbers; I denotes the closed unit interval $[0,1]$ and I^0 denotes the interior of I, i.e. the open interval $]0,1[$. For $n \in \mathbb{N}$, let

$$\Gamma_n = \left\{(p_1,\ldots,p_n);\ p_i \geq 0,\ i=1,\ldots,n;\ \sum_{i=1}^{n} p_i = 1\right\}$$

denote the set of all finite n-component complete discrete probability distributions with nonnegative elements.

In current mathematical literature, *Pexider's equation* and equation of *Pexider type* appear frequently. It is worth a mention that it was introduced by a Czech mathematician J. V. Pexider around early twentieth century [2]. Today, more than a hundred years later, Pexider's equation appears quite often in pure and applied mathematics. One such area of mathematics where this phenomenon has played a significant role is the *sum form functional equations*.

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Innovation adoption modeling incorporating market expansion and change point attribute

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Abstract

Today, in an era of high technological products, the rate of innovation and knowledge creation plays a pivotal role in continued firm growth. In the last few decades, it has been observed that the world of product development and its management has evolved rapidly. In particular, the use of feature-addition or otherwise bringing some change in the marketing strategy after a certain time point (change point) is fast becoming commonplace. These attributes like: entry/exits of the competitor, change in price, change in quality, environmental changes, etc. tend to bring a remarkable change in the overall sales of an existing product mix. Many innovation diffusion models have been

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Studying Multi-Stage Diffusion Dynamics using Epidemic Modeling Framework

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Abstract
Buying process has always carried a two-fold perspective with itself. On one hand, it is important for individuals and on other hand it is equally important for the firms to deliver the perfect need and want to the customer. Amongst this entire process, awareness along with positive motivation towards the product; plays an equally significant role in strategizing the plans for any company. Plenty of models have been proposed and many would be in the pipeline that have talked about the connectivity of these processes and their impact on the final adoption. In the current work, these processes have been studied through the analogy taken from epidemic modelling framework. Furthermore, an approximation method; Range Kutta of 4^{th} order has been utilized to come to a near approximate solution to the otherwise available non-closed form solution. The proposed modelling framework is validated on real-life data sets and the results depict the existence and presence of various stages under consideration.

Keywords- Buying behaviour, Epidemiology, Innovation adoption, Runge-Kutta method, SIR-model.

1. Introduction

In today's hectic and technological environment, all living and non-living things around the world have to struggle to maintain their existence. There is an adage that change is the law of nature and if you don't change with nature then your existence will be finished. The golden toad (Bufoperigones), Polar Bear, Adelie Penguin, North Atlantic Cod etc. are some species which did not change themselves according to nature so these species become either extinct or are on the verge of extinction (Crump et al.,1992; Lynch et al., 2014; Myers and Worm, 2005). A similar thing happens in market, if a company does not change its product according to the demand of potential customers, the product gets eliminated from the market (Bumgardner et al., 2011). Motorola, an American telephone company that launched the first handphone in 1973, failed after a few years because this company didn't change the software of the phone according to

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AN ENVIRONMENTALLY FRIENDLY, EFFICIENT, AND FACILE METHODOLOGY FOR THE NITRATION OF AROMATIC COMPOUNDS USING UREA NITRATE

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ABSTRACT

An efficient, environmentally friendly, and facile methodology is developed for room temperature nitration of variously substituted aromatic compounds using urea nitrate and concentrated sulphuric acid. The method uses a simple aqueous workup without organic solvents and results in the formation of mono-nitro compounds in excellent yields. Amides are nitrated smoothly without hydrolysis of the amide function.

Keywords: Aromatic Nitration, Urea Nitrate, Room Temperature Nitration, Regioselective Nitration, Mononitration.

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INTRODUCTION

Nitration of aromatic substrates is a classical reaction of immense synthetic utility, engaging the unabated interest of researchers even today. The nitroaromatic compounds find many applications as intermediates in dyes, pharmaceuticals, explosives, plastics, and other industries. Classically nitration has been carried out chiefly with mixtures of concentrated nitric acid and concentrated sulphuric acid, known as mixed acid nitration. Newer reagents and preparative methods have evolved, each with specific attributes.[1] With the growth of environmentally friendly methods of synthesis over the past few decades, several reports on greener and safer methods of synthesis have appeared in the literature.[2,3] Aromatic nitration reactions using urea nitrate have been reported in the literature to yield synthetically significant and useful results.[4-8] Regioselectivity and mononitration are among the important advantages. Side reactions, which accompany classical mixed acid nitration reactions are usually not observed in nitration reactions using urea nitrate.[9-10] This, coupled with the ease of preparation and low cost of urea nitrate, and milder reaction conditions, makes it an attractive method for the nitration of aromatic compounds. This paper presents the results of the nitration of aromatic compounds using urea nitrate and concentrated sulphuric acid, applied to compounds having substituents with different directive influences including those which are susceptible to hydrolysis such as amides and anilides. All reactions were accomplished smoothly at room temperature, even in the case of toluene, chlorobenzene, and bromobenzene which normally require heating in classical mixed-acid nitration methods.

EXPERIMENTAL

Materials and Equipment

All starting materials were purchased from chemical suppliers and purified by crystallization or distillation before use. Solvents for crystallization were also distilled before use. Melting points were determined using a novel apparatus, BODMEL.[11] This is a safe and highly reliable method and uses only a small volume (~2 mL) of concentrated sulphuric acid as compared to the conventional methods that use larger volumes.[12] Authentic samples for comparisons were purchased from Sigma Aldrich.

Preparation of Urea Nitrate (UN)

Urea nitrate (UN) was prepared according to a recent literature procedure by adding concentrated nitric acid (5.75mL) dropwise with stirring to a cold (10^0C) nearly saturated aqueous solution of urea (10.8g).[13] A white crystalline solid separated almost immediately. It was washed with ice-cold water. Air drying gave

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REVIEW

Trends in Food Packaging: A Comprehensive Review

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Food packaging is one of the fastest developing components of the food industry and the one where innovations are constantly happening according to the ever-evolving needs of the market. Food market is responsible for global food packaging approximately to 35%. Food packaging is conventionally required to have many functions like containing and protecting the food, having a specific space for nutrition facts labels, shelf life, adding a distinct brand identity and packaging the food in a way that consumers are attracted to it. However, focus on solely packaging can only address the symptoms of the problem, but does not cater the underlying systemic causes for the rapid growth and dependance on packaging. The deleterious effects of conventional packaging materials on environment and human health and the public awareness about the same, have prompted food industry to transit towards sustainable packaging. Packaging material, these days, is being manufactured using green technology and various practices to optimize the use of materials and energy. There is a growing demand for packaging through the use of edible or biodegradable materials, plant extracts and nanomaterial. Consumers are interested in packaging that increases shelf-life, tells them about the food it contains and uses technology to enhance the quality and safety of food packed within. Therefore, a completely new generation of packaging material is now being developed to monitor the property of packed food as well as their environmental sustainability. This article gives an overview of conventional packing, critically evaluates its environment and health impacts and discusses current trends and advances in the food packaging industry including active, intelligent and green technologies like edible and nanomaterial-based packaging. It is evident that the development of novel technologies using biodegradable nano based composite material have enhanced shelf life and passive properties (mechanical, thermal and barrier performance) of food but still there is need to research the migration, toxicity and environmental implications of the existing ingredients used for packaging and work towards searching novel renewable resources to prepare the biocompatible packaging materials, their processing to improve performance and finally their up-scale production.

Keywords: Food packaging, Chemicals, Environment impact, Edible packaging, Active packaging, Nanomaterials.

INTRODUCTION

Food packaging is the packaging of the food product to protect it from contamination and damage besides conserving taste and quality during its shelf life. It is one of the essential steps of preparation processes in the food industry to preserve the quality of food products for long term storage, export and final utilization. Food packaging assists in the protection of food from biochemical deterioration while ensuring hygiene. It can also be helpful in reducing the food waste [1-3] generated due to the spoilage during food transportation [2] (Fig. 1). Growing population, convenience of packaged food and hectic lifestyle have increased the demand of packaged food. At the same time, a consumer gets attracted to fancy packaging. This is why the food packaging industry has grown exponentially in recent years. The global food packaging market was estimated to be approximately US $ 394 billion in 2018 and will reach US $ 606 billion by 2026 as reported by research report of Fortune Business Insights [4].

There are three subsequent levels of food packaging. Primary packaging first envelops the product and remains in direct contact with contents, followed by secondary packaging

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Research Article

STUDIES ON THE SYNTHESIS AND CHARACTERISATION OF MOLYBDENUM (V) ORGANOPHOSPHONIUM COMPLEXES

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ABSTRACT

The reaccction between Molybdenum (V) chloride and diphenyl chlorophosphine, tripheayl phosphine in presence of t-butychloride, iso-butylchloride, t-amylalchloride, cyclohexylchloride and triphenyl methylchloride as alkylating agents have been studied. The molybdenum (V) derivatives of the type $\left[Bu^{t}Ph_2PCl\right]^{+}\left[MoCl_6\right]^{-}$ (I), $\left[Bu^{iso}Ph_2PCl\right]^{+}\left[MoCl_6\right]^{-}$ (II) $\left[Am^{t}Ph_2PCl\right]^{+}\left[MoCl_6\right]^{-}$ (III) $\left[C_6H_{11}Ph_2PCl\right]^{+}\left[MoCl_6\right]^{-}$ (IV) $\left[Ph_3C\,Ph_2PCl\right]^{+}\left[MoCl_6\right]^{-}$ (V), $\left[Bu^{t}Ph_3P\right]^{+}\left[MoCl_6\right]^{-}$ (VI) $\left[Bu^{iso}Ph_3P\right]^{+}\left[MoCl_6\right]^{-}$ (VII) $\left[Am^{t}Ph_3P\right]^{+}\left[MoCl_6\right]^{-}$ (VIII), $\left[C_6H_{11}Ph_3P\right]^{+}\left[MoCl_6\right]^{-}$ (IX), $\left[Ph_3C\,Ph_3P\right]^{+}\left[MoCl_6\right]^{-}$ (X) have been isolated 1 : 1 molar reaction.The reactions have been carried out in organic solvents media like CCl_4 or CH_2Cl_2 or acetonitrile at room temperatures. The general reaction is given as:

$$MoCl_5 + R_xPCl_{3-x} + R'Cl \rightarrow \left[R_xR'PCl_{3-x}\right]_3^{+}\left[MoCl_6\right]^{3-}$$

Where $x = 1, 2, 3$ $R = Ph, Cl,$ $R' = Bu^{t}, Bu^{iso}, Am^{t}, Cydohexyl, Ph_3C$

The isolated components are coloured solides. The compounds are insoluble in organic solvents. The compounds are highly sensitive to air moisture. They are stiky in nature. The compounds have bben characterized by elemental analysis, Infra-red (near and far) spectral studies, electrical conductivity and magnetic susceptibility.

INTRODUCTION

The reaction between organophosphins, and alkyl/aryl halide gave an ionic product like $[R_4P]^{+}X^{-}$ containing organophosphonium cation and halide anion[1]. The formation of adducts between trichlorophosphine and metal halides of metals like Pt[2], Pd[3], Au[4], Cu[5], Cr[6] and Ti[7] have been reported in literature. The formation of organophosphonium derivatives of Aluminum (III) chloride and trichlorophosphine in presence of several alkyl/aryl chlories in dichloromethane solvent have been reported[8-11]. Puri and Saini[12] have reported the formation of organophosphonium derivatives of $Fecl_3$, $Nbcl_5$ and $Tacl_5$[13]with Pcl_3 and $MePcl_2$ in presence of alkyl/aryl chlorides as akylating agents, Puri and Saini[14] and Bullock et.al[15] reported the formation of ionic product $[RR'Pcl_2]^{+}[Wcl_6]^{-}$ in the reaction of tungsten (V) chloride, trichlorophosphine or methyl/phenyl dichlorophine in presence of alkyl/aryl chloride as alkylating agents, Bullock et.al[16] also reported the formation of $\left[Bu^{t}Pcl_3\right]^{+}\left[Re_3cl_9\right]^{-}$ complex having Re-Re bond in anion. The formation of phosphonium derivatives as chloro Bromo and mixed chloro=Bromo mettalates of metals like Zn, Cd, Hg, Ce, Au, Pd and Pt were reported by Burmiester et.al[17] and clark, etl.al.[18]Keeping view of the fact that chloro metallates of phosphonium cation have wide utility as better catalysis in synethetic and polymers ion reactions of olefins and acetylene as well as of great biological activity, the organopohsphonium derivaties of molybdenum (V) were synthesized and characterized by chemical analysis, infrared spectral studies, electrical conductivity and magnetic susceptibility measurements.

MATERIAL AND METHODS

Chemicals

Molybdenum (V) chloride (Fluka) was used as such after drying and analysis. Diphenyl chlorophosphine, triphenyl phosphine, alkylating agents as t-butyl, iso-butyl, t-amyl, cyclohexyl and triphenyl chlorides, organic solvents like carbon tetra chloride, methelen chloride and acetonitrate were used after making anhydrous by known methods.

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Biodegradation of Natural Rubber by Fungi and Bacteria

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ABSTRACT

Environmental pollution is currently one of the major problems that are threatening biodiversity, ecosystems, and human health around the world. Natural rubber, which is one of the most significant polymers due to its variety of uses, has now become a serious environmental concern. Rubber waste management poses one of the greatest problems because it is extremely resilient and persists in the environment despite several mitigation efforts. Biodegradation is an eco-friendly alternative to conventional disposal methods and has gained tremendous interest in recent years. Several studies on rubber biodegradation utilizing fungi and bacteria have been reported. However, except for a few studies on technical applications, the majority of research on these microbes has focused on the fundamentals of rubber biodegradation. The challenge with biodegradation as a potential solution for rubber waste management is that we have limited mechanistic insight into rubber biodegradation, and the complicated composition of rubber products inhibits cell growth and activity of microbes. Thus it becomes important to fully comprehend the mechanism of rubber biodegradation and continue the search for new microbial strains so that the acquired knowledge can be utilized to develop a biodegradation process suitable for scale-up. In this short review, rubber degradation using fungi and bacteria is highlighted.

INTRODUCTION

Rubber, due to its exceptional qualities like flexibility, longevity, and a wide range of uses, has become one of the most essential commodities in today's world. As per the Malaysian Rubber Council, world production of rubber increased by 3.3% to 7.0 million tonnes in the first quarter of 2021, compared to 6.8 million tonnes in the same period of 2020. Similarly, world consumption of rubber grew by 14.8% to 7.4 million tonnes in the first quarter of 2021, compared to 6.5 million tonnes in the same period of 2020 (Malaysian Rubber Council 2021). With the increase in consumption, wastage of rubber in the form of used rubber products especially scrap tires has increased. Rubber waste management is an extremely challenging task for Municipal Corporation. The biggest challenge comes in the form of recycling. Rubber is highly durable and inherently non-biodegradable, leaving them stagnant in landfills for hundreds of years, occupying valuable space. Many cities have scrap tire stockpiles, which cause public health, environmental, and aesthetic issues (Yehia 2004).

Many plants, primarily from the Euphorbiaceae, Compositae, Moraceae, Eucommiaceae, Celastraceae and Apocynaceae families, produce rubber by enzymatic activities. Chemically NR is a polyisoprene polymer. There are mainly two types of polyisoprenoids based on isomerism, the cis isomer natural rubber (NR) [poly(*cis*-1,4-isoprene)] and the trans isomer gutta-percha (GP) [poly(*trans*-1,4-isoprene)] (Fig. 1).

Natural Rubber can be obtained from plants such as *Hevea brasiliensis* (rubber tree), *Parthenium argentatum* (guayule), *Taraxacum kok-saghyz* (Russian dandelion), *Dyera costulata* (jelutong). Gutta-percha on the other hand can be obtained from *Palaquium gutta* (gutta-percha), *Manikara zapota* (chico), *Eucommia ulmoides* (Tochu), *Euonymus europaeus* (spindle tree), *Mimusops balata* (balata) (Yikmis & Steinbüchel 2012). For commercial uses, NR is produced from the latex of *Hevea brasiliensis*, a South American plant endemic to the Amazon Valley. The first scientific or commercial interest in rubber was demonstrated by Frenchman Charles Marie de Condamine, who submitted a report to the

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PHOTOCATALYTIC PROPERTIES OF BIOLOGICALLY SYNTHESIZED UNCOATED AND CALCIUM COATED ZnO NANOPARTICLES USING CUCUMBER JUICE

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ABSTRACT

Uncoated ZnO and calcium-coated ZnO nanoparticles (Ca-ZnO) were biologically synthesized using cucumber juice as a reducing and capping agent. Cucumber belongs to *Cucurbitaceae* family, is rich in water content and possesses antioxidant activity. The chemical composition and morphology of the synthesized NPs were determined by scanning electron microscopy (SEM), energy dispersive X-ray spectrophotometer (EDS), high-resolution transmission electron microscopy (HR-TEM), X-ray diffraction (XRD)and FT-IR. The spherical as well as hexagonal-shaped ZnO nanoparticles were obtained in the size range of 4-70 nm. Coated and uncoated ZnO nanoparticles were evaluated for their photo degradability of methylene blue (MB) and rhodamine B (RB) dyes. They showed nearly 100% photodegradation of methylene blue in lesser time, however, showed minimum degradation of rhodamine B dye. Calcium coating over ZnO NPs enhanced their photocatalytic properties.

Keywords: Cucumber Juice, Methylene Blue, Rhodamine Blue, Biological Method, ZnO NPs, Photocatalysts.

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INTRODUCTION

These days world is facing two major challenges associated with "P" i.e., Population explosion and Pollution. Both Ps are in the hands of human beings. Although population explosion has been controlled to some extent by awareness campaign programs, but pollution seems to be difficult in the era of rapid industrialization. Several agricultural practices as well as industrial activities like the use of pesticides, herbicides, dyes, pharmaceuticals, etc.[1-3] are the matter of concern for the scientific world and environmentalists. These anthropogenic activities lead to water and soil pollution. Organic pollutant effluents in water, textile and pharmaceutical industries, in particular, are the biggest challenges that require attention to maintain a healthy environment. Textile industries discharge dyes and pigments loaded water into natural water resources. These organic pollutants adversely disturb the ecological balance in aquatic life due to their toxicity, complexity of structure and perseverance. However, industries have been using various physical techniques such as coagulation, ion exchange chromatography, activated carbon, reverse osmosis, and ultrafiltration for their disposal.[4-5] In this regard, the development of efficient technology for water as well as soil remediation is imperative to safeguard the environment. In recent years, several nano-based technologies have been adopted due to wide applications from solar fuel, cosmetic, medicaland photocatalytic properties. Several metal/metal oxide nanoparticles such as Ag, Au, TiO_2, CuO, ZnO, etc. have been examined for their photocatalytic properties in the decolorization of textile wastewater.[6-9] These nanoparticles have frequently been used in the treatment of wastewater as they lead tothe complete mineralization of contaminants due to redox reactions.[10-11] Nanoparticles of rare earth metals have also been gaining interest because of their good optical and catalytic properties.[12-14] Among all, Titanium oxide (TiO_2)

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TiO_2 based Photocatalysis membranes: An efficient strategy for pharmaceutical mineralization

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What do these dates mean?

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ORIGINAL RESEARCH ARTICLE

Theoretical Investigation of Structure, Dynamics and Entropy Correlation in Liquid Fe–Al Alloys

RAJ KUMAR MISHRA, C. LALNUNTLUANGA, and SANJEEV KUMAR MISHRA

Chemical ordering through two microscopic functions namely concentration-concentration fluctuation as k tends to zero, $S_{CC}(0)$ and the Warren-Cowley ordering parameter, α' have been theoretically investigated in Fe–Al melts as function of Al concentration under pair wise square-well (SW) potential function. In view of ordering phenomena in melts, partial and total structure functions, $g(r)$ and self and mutual diffusion coefficients have been theoretically formulated and computed at different compositions of Al in Fe–Al melts. Total structure factor obtained using SW potential function at four compositions of Al are in good agreement with X-ray data obtained by Roik *et al*. Excess entropy in melts has been determined using computed values of transport coefficients and Dzugutov scaling law. Stokes–Einstein (SE) relation is modified by substituting hydrodynamic radius by nearest neighbor distance in pair correlation function. Validity of the SE relation was examined by comparing theoretically obtained data of viscosity coefficients with experimental values and correlated with excess entropy of the melts obtained through two body approximation. Various physico-chemical properties of industrially important Fe–Al alloys have been reported to establish their correlation with microscopic structure functions.

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I. INTRODUCTION

Fe–Al alloys possess low density and significantly better corrosion resistance as compared to stainless steel and are thus highly applicable for industrial purposes.[1,2] This binary alloy is also used for manufacturing of many industrially important alloys. It is well-known fact that the structure of materials along with their physico-chemical properties helps to understand their utility for useful purposes. Liquid Fe–Al alloy has been extensively studied experimentally using X-ray diffraction technique to determine atomic-level structure,[2,3] using automated equipment viscosities have been measured,[4,5] moreover, thermodynamic and chemical ordering have been reported using complex formation model.[6]

Various factors like intermolecular forces and the arrangement of constituent atoms in a liquid state make their studies much more complicated than solids or gases. Works on the atomic scale correlations and derive associated properties of Fe–Al metallic melts have been performed through theoretical calculations, atomistic simulation techniques, and experimental approaches.[3–6] Knowledge of the structure and physico-chemical properties of metallic liquids provides a better understanding of their nucleation process, glass formation, metallurgy, and technological applications.[7–13] Transport coefficients especially diffusivity and viscosity of liquid metals and alloys are important parameter for designing their metallurgical processes and quantitative estimation of various kinetic processes.[14,15]

The SW potential includes both repulsive and attractive part and moreover easy to solve analytically. Due to suitability of the SW potential function for different theoretical techniques like integral equation theory or perturbation theory, it has been used for the computation of different aspects of materials like metallic liquids,[7,13] colloidal particles,[16,17] hetero chain molecules,[18,19] complex systems,[20,21] and bio molecules.[22,23] The SW liquid possess all characteristics of real fluids, thus we determine structure functions and derived physico-chemical properties of liquid Fe–Al alloys using this pair potential function under Mean Spherical Model Approximation (MSMA). Such model

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Research Article

Arbuscular mycorrhizas accelerate the degradation of colour containing organic pollutants present in distillery spent wash leachates

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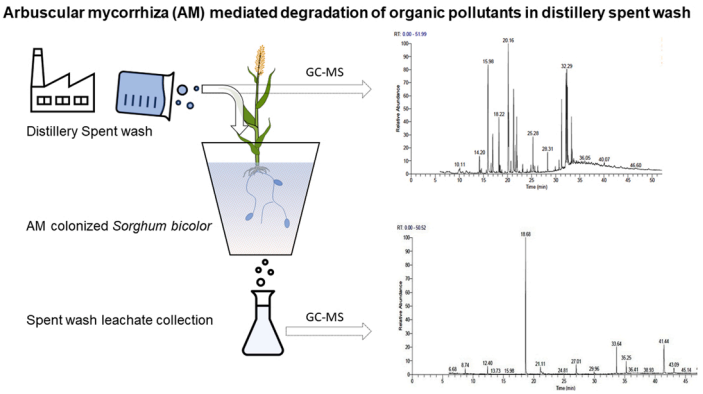
HIGHLIGHTS

- Mycorrhizal degradation of organic pollutants in spent wash was studied.
- Mycorrhizal and non-mycorrhizal *Sorghum bicolor* were fertilized with spent wash.
- Raw spent wash contained 65 complex coloured organic compounds.
- Non-mycorrhizal plants reduced complex coloured organic compound number to 42.
- Mycorrhizal plants reduced the number to only 26 colourless organic compounds.

GRAPHICAL ABSTRACT



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ABSTRACT

Distillery spent wash (DSW) from molasses-based distilleries is being used as a low-cost alternative to chemical fertilizers in countries like India and Brazil. However, using DSW as a fertilizer substitute causes organic pollutant leaching, including melanoidins and caramel colourants that turn bodies of water dark brown. This study investigated the arbuscular mycorrhiza (AM) mediated degradation of organic pollutants in DSW.

Mycorrhizal and non-mycorrhizal *Sorghum bicolor* were grown in microcosms for 16 weeks. The plants were fertilized with either raw DSW or Hoagland solution. Leachates draining from the microcosms after fertilization were collected three times in 30-day intervals. Each 30-day collection was preceded by two fertilizations. A gas chromatography-mass spectrometry comparative analyses of raw DSW with leachates of the third collection from mycorrhizal and non-mycorrhizal microcosms was made. Sixty-five and 42 complex organic compounds were detected in raw DSW and leachate collected from the non-mycorrhizal pots respectively. Only 26 compounds were detected in leachate collected from mycorrhizal pots. Absent from leachate of the mycorrhizal pots were: colour-containing organic compounds diacetone alcohol; 3-amino-2-cyano-6-methyl-6,7-dihydrothieno[2,3-*b*] pyrazine S-oxide; cyclohexane; 1,2-benzenedicarboxylic acid, butyl 8-methylnonyl ester; 2-pyrrolidinone; and

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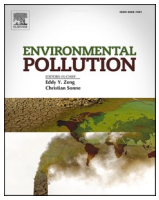

Arbuscular mycorrhizas amplify the risk of heavy metal transfer to human food chain from fly ash ameliorated agricultural soils☆

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ABSTRACT

Soil contaminants threaten global food security by posing threats to food safety through food chain pollution. Fly ash is a potential agent of soil contamination that contains heavy metals and hazardous pollutants. However, being rich in macro- and micronutrients that have direct beneficial effects on plant growth, fly ash has been recommended as a low-cost soil ameliorant in agriculture in countries of the Global South. Arbuscular mycorrhizal fungi (AMF), ubiquitous in agricultural soils, enhance efficiency of plant nutrient uptake from soils but can equally increase uptake of toxic pollutants from fly ash ameliorated soils to edible crop tissues. We investigated AMF-mediated amplification of nutrient and heavy metal uptake from fly ash amended soils to shoots, roots and grains of barley. We used a microcosm-based experiment to analyse the impacts of fly ash amendments to soil in concentrations of 0 (control), 15, 30 or 50% respectively, on root colonization by AMF *Rhizophagus irregularis* and AMF-mediated transfer of N, P and heavy metals: Ni, Co, Pb and Cr to barley tissues. These concentrations of fly ash are equivalent to 0, 137, 275 and 458 t ha^{-1} respectively, in soil. Root AMF colonization correlated negatively with fly ash concentration and was not detected at 50% fly ash amendment. Shoots, roots and grains of mycorrhizal barley grown with 15, 30 and 50% fly ash amendments had significantly higher concentrations of Ni, Co, Pb and Cr compared to the control and their respective non-mycorrhizal counterparts. Presence of heavy metals in barley plants grown with fly ash amended soil and their increased AMF-mediated translocation to edible grains may significantly enhance the volume of heavy metals entering the human food chain. We recommend careful assessment of manipulation of agricultural soils with fly ash as heavy metal accumulation in agricultural soils and human tissues may cause irreversible damage.

1. Introduction

Soil contaminants threaten global food security by posing threats to food safety due to food chain pollution (Kopittke et al., 2019; Hou et al., 2020). Fly ash is a potential agent of soil contamination that contains heavy metals (e.g. Ni, Co, Pb, Cr, Hg, Cd), hazardous organic pollutants (e.g. carcinogenic polyaromatic hydrocarbons and polychlorinated biphenyls) and radionuclides such as ^{238}U, ^{226}Ra, ^{232}Th, ^{40}K and ^{210}Po (Sahu et al., 2009, 2014; Meer and Nazir, 2018; Jambhulkar et al., 2018; Singh et al., 2023). It is a human-made industrial by-product of coal combustion in thermal power plants and other coal and biomass burning industries. Global annual production of fly ash is 800 million tonnes per year and is expected to increase to 2100 million tonnes by 2032 (Song et al., 2020). Depending on the source and type of coal, fly ash is rich in macro- and micronutrients which have direct beneficial effect on plant growth. When applied to soil, fly ash acts as a conditioner by altering soil texture, nutrient content, cation exchange and water retention (Channabasava et al., 2015; Yao et al., 2015; Yadav and Pandita, 2019). Due to these qualities, and the need to economically dispose of the large quantities generated by thermal power plants and other coal burning industries, fly ash has been recommended as a low-cost soil ameliorant in agriculture in countries of the Global South (Ukwattage et al., 2013; Dash et al., 2015).

Fly ash amended agricultural soils will invariably contain arbuscular

☆ This paper has been recommended for acceptance by SU SHIUNG LAM.

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Antagonistic Activity of *Pseudomonas fluorescens* Strain X1 Against Different Fusaria and it's In Vivo Analysis Against *Fusarium udum* Infected Pigeon Pea

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Abstract

A plant growth-promoting rhizobacterial strain, *Pseudomonas fluorescens* X1 isolated from the garden soil was employed for antagonistic activity against different species of fusaria. Strain X1 inhibited four different fusaria (*Fusarium moniliforme*, *Fusarium oxysporum*, *Fusarium semitectum* and *Fusarium udum*) in dual culture plate assay, and in broth culture using cell-free culture filtrate. Scanning electron microscopic (SEM) analysis revealed deformation and shrinkage in mycelia of fusaria after treatment with strain X1. Confocal micrographs showed degeneration of nuclei inside the cells of fusaria for the same effect. Strain X1 exhibited maximum antifungal activity, when it was grown in nutrient broth yeast (NBY) medium amended with 1 mM NH_4MoO_4 and 1% glucose. The antifungal extracts eluted from thin-layer chromatography (TLC) followed by high performance liquid chromatography (HPLC) showed two fractions active against different fusaria. Liquid chromatography-mass spectrometry (LCMS) analysis of the two fractions 1 and 2 corresponded to molecular ions at m/z 177.16 and m/z 177.09, respectively. Infra-red (IR) analysis showed five similar absorption bands in both the fractions analysed. In vivo analysis of strain X1 alone and along with fungicide inhibited the growth of *F. udum* and improved the biomass and growth of pigeon pea. These results indicated that strain X1 could be possibly used as a biocontrol agent to inhibit the growth of soil-borne diseases of different fusaria including *F. udum* that causes wilting in pigeon pea.

Introduction

Fusaria are one of the most important soil-borne phytopathogens and are distributed worldwide (Rosado-Álvarez et al. 2014). They produce at least 35 different types of mycotoxins (Ma et al. 2010; Gutleb et al. 2002). Fusaria as soil harboured myriads threaten and affect the productivity of plant communities causing serious economic loss in agricultural systems (Latz et al. 2012). Major constraint of fusaria to plant productivity comes from species like *Fusarium moniliforme*, *Fusarium oxysporum*, *Fusarium semitectum*, *Fusarium udum*, etc. (Pfenning et al. 2019; Gordon 2017; Jiang et al. 2016; Li et al. 2018).

F. udum Butler causes wilt in one of the most important legume crop, pigeon pea [*Cajanus cajan* (L.) Millsp.] (family: Fabaceae) (Reddy et al. 2012). *F. udum* multiplies by producing chlamydospores, macroconidia and microconidia, and develops symptoms like chlorosis and wilting on infected plants (Pfenning et al. 2019; Purohit et al. 2017). The disease may occur in different periods of the plant development including seedling, podding growth and flowering stages (Purohit et al. 2017). Susceptible plant cultivars may yield up to complete loss of the harvest after the disease (Sharma et al. 2016).

This disease is more prevalent in countries like India, Nepal, Myanmar, Kenya, Malawi and Tanzania than any other part of the world (Saxena et al. 2012). India alone yields nearly 90% of the total world pigeon pea production (2.51 million tons) cultivated in 3.58 M ha area, and is also the second most important pulse crop in the nation (Kumar et al. 2010; Varshney et al. 2010; Kotresh et al. 2006). Nearly 209 different pathogens other than *F. udum* can produce various diseases in pigeon pea (Nene et al. 1996). But majorly, wilt in pigeon pea

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REVIEW ARTICLE

A comprehensive review on chromium (Cr) contamination and Cr(VI)-resistant extremophiles in diverse extreme environments

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Abstract

Chromium (Cr) compounds are usually toxins and exist abundantly in two different forms, Cr(VI) and Cr(III), in nature. Their contamination in any environment is a major problem. Many extreme environments including cold climate, warm climate, acidic environment, basic/alkaline environment, hypersaline environment, radiation, drought, high pressure, and anaerobic conditions have accumulated elevated Cr contamination. These harsh physicochemical conditions associated with Cr(VI) contamination damage biological systems in various ways. However, several unique microorganisms belonging to phylogenetically distant taxa (bacteria, fungi, and microalgae) owing to different and very distinct physiological characteristics can withstand extremities of Cr(VI) in different physicochemical environments. These challenging situations offer great potential and extended proficiencies in extremophiles for environmental and biotechnological applications. On these issues, the present review draws attention to Cr(VI) contamination from diverse extreme environmental regions. The study gives a detailed account on the ecology and biogeography of Cr(VI)-resistant microorganisms in inhospitable environments, and their use for detoxifying Cr(VI) and other applications. The study also focuses on physiological, multi-omics, and genetic engineering approaches of Cr(VI)-resistant extremophiles.

Keywords Chromium · Chromium detoxification · Ecology and biogeography · Extremophile · Harsh physical situations · Microorganisms

Introduction

Chromium (Cr) is the 17th and 21st most abundant element in the earth's mantle and crust, respectively (Avudainayagam et al. 2003; Barnhart 1997). The average concentrations of Cr in these respective regions are 2500 mg/kg and ~125 mg/kg (Rudnick and Gao 2003; IARC 1990). In contrast, natural water may contain as high as 4000 nmol/l Cr (Richard and Bourg 1991). With approximately forty different minerals found in nature, Cr mainly exists as chromite, which is a natural oxide of Cr and Fe and sometimes associated with Mn and Al (Waseem and Arshad 2016). Cr is reported in four different stable isotopes (^{50}Cr, ^{52}Cr, ^{53}Cr, and ^{54}Cr) of which ^{52}Cr is the most abundant (Ellis et al. 2002). Furthermore, this element possesses numerous oxidation states ranging from −2 to +6, of which only Cr(VI) and Cr(III) are widespread in the environment (Ran et al. 2016).

Cr is widely used in tanning, electroplating, steel production, alloying, wood preservation, pigmentation, textile dyeing, nuclear reactors, and preparation of ceramic glazes, resulting in Cr-containing effluents being discharged in the

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Review article

Regulation of ethylene metabolism in tomato under salinity stress involving linkages with important physiological signaling pathways

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Air pollution and climate change impact on forest ecosystems in Asian region – a review

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ABSTRACT

Forests are complex ecosystems comprising various trophic levels responsible for carrying out various biogeochemical processes and providing ecosystem services. However, forests in Asia are doubly challenged by climate change and air pollution. The rapidly changing air quality, with increasing concentration of greenhouse gases (GHGs), trace gases, volatile organic compounds (VOCs), and ozone (O_3) also causes global warming leading to climate change, thus jointly creating a challenging condition for the forest ecosystem. The impact on forest ecosystems of the two anthropogenic stressors, viz., climate change and air pollution, requires global attention. These two stressors have been widely studied separately but their combined impact on the forest ecosystem has not been studied extensively, particularly in the Asian region. In this review article, we attempt to explore the importance of interlinking air pollution and climate change impact on Asian forests, by studying the decline of different forest types as a background and markers of forest ecosystem degradation. Our main aim is to understand and summarise the past and ongoing research in this area and to facilitate researchers and policy-makers to upgrade their research, policies, and management strategies in the area of integration of air pollution and climate change impact on forest ecosystems in the Asian region.

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Air pollution; climate change; nutrient cycling; forests degradation; asia

Introduction

Climate change and air pollution are two intertwined components that have a strong influence on the forest. Matyssek et al.(2012) described air pollution as a component of climate change. In the atmosphere, anthropogenic and biogenic emissions play an important role in causing air pollution and climate change. Due to chemical reactions occurring in the atmosphere, a number of secondary air pollutants are formed. O_3 is one of the secondary air pollutants which is highly phytotoxic in nature. Biogenic volatile organic compounds (BVOCs) particularly emitted from trees have a significant contribution to the formation of O_3 (Ng et al. 2008; Tasoglou and Pandis 2015). However, the roles of BVOCs and climate for future O_3 formation are still unclear. Climate change may well increase foliage in most regions, particularly in boreal and temperate regions and this alongwith direct temperature effects can be responsible to accelerate the increase in BVOC emissions in the future and therefore further contributes to an increase in O_3 production (Bai and Hao 2018). Carbon dioxide (CO_2) is also released from natural as well as anthropogenic combustion-related sources. Thus, O_3 and CO_2 both are important greenhouse gases that play a vital role in increasing the earth surface temperature, change in weather, and precipitation patterns that ultimately cause climate change (Karnosky et al. 2002; IPCC 2007; Shi et al. 2016; Guevara-Ochoa et al. 2020; Gruda et al. 2021). Moreover, nitric acid and sulphuric acid are also formed from oxides of nitrogen (NO_x) and sulphur dioxide (SO_2) respectively and play an important role in acid deposition. Acid deposition processes hamper the environment particularly, forest ecosystem health. Thus, the changing climate also affects biogeochemical cycles that further worsen the atmosphere and provide an environment conducive to the formation of secondary pollutants (Ning et al. 2020; Sonwani and Maurya 2018). This has all been explained clearly in the schematic representation of the interlink between air pollution and climate change in Figure 1.

Climate change and air pollution are serious threats to forests. Forest ecosystems are a function of biological (plants, animals, micro-organisms), physical (soil, water, temperature, light, precipitation, etc.), and chemical (organic and inorganic constituents) factors that interact with one another to form a self-sustaining ecosystem on their own. Globally, forests cover 30% of the terrestrial land, act as a carbon sink and store 80% of all aboveground carbon and more than 70% of all soil organic carbon (Joshi and Singh 2020). The combined effects of air pollution and climate change have the capacity to turn a forest from a C sink to a C source that can further change the dynamics of atmospheric conditions. The key determinants for evaluating the integration of air pollution and climate change are air quality with respect to CO_2

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Carbonaceous aerosol variability and SOA formation during foggy days in Delhi, India

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The variability of organic carbon (OC), elemental carbon (EC), and secondary organic aerosol (SOA) and their relationship with meteorological parameters have been studied during foggy and non-foggy days in the peak winter months (December–January) from 2015 to 2016 in Delhi, India. Different sectoral locations were chosen based on predominant industrial, traffic, and residential activities with a background location. The average level of OC, EC, and SOA was found to be 7.47 ± 7.74, 0.69 ± 0.7, and 10.46 ± 10.76 $\mu g/m^3$, respectively, during the foggy period and 6.1 ± 6.8, 0.9 ± 1.1, and 9.1 ± 10.6 $\mu g/m^3$, respectively, during the non-foggy period in Delhi. A relatively higher SOA level was observed at industrial and traffic intersection sites, which indicates the proximity of the dominant source of OC that play a significant role in SOA formation. It was also found that SOA production is associated with the OC/EC ratio and may vary from site to site. Correlation analysis has confirmed that OC is having a significant strong positive correlation with EC and SOA, while EC is showing a significant moderate positive correlation with SOA. Ambient temperature (AT) shows a significant negative moderate correlation with OC levels and SOA and formation. Due to hydrophilicity (hydrophobicity) of OC (EC), its average concentration was found high (less) due to its high (less) scavenging during foggy days in comparison to non-foggy days. The study further suggests the significant impact of source variability on SOA formation due to the different nature of sector-wise sites during foggy days in Delhi.

KEYWORDS

organic carbon, elemental carbon, air quality, secondary organic aerosol, Delhi

Introduction

Airborne particulate matter (PM) is composed of a variety of inorganic and organic species including carbonaceous aerosol. Carbonaceous aerosol is composed of organic carbon (OC) and elemental carbon (EC); due to radiative properties, EC is also known as black carbon (BC) (Dutkiewicz et al., 2009). The carbonaceous aerosol is produced from the incomplete combustion of organic materials such as coal, petroleum, and biomass (Seinfeld and Pandis, 2006). The OC is directly released into the atmosphere in the particle phase (primary organic aerosol) or the gas phase.

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Covid-19 cases in Morocco: A comparative analysis

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Abstract

Covid-19 is a highly infectious disease caused by novel Corona virus SARS-CoV-2, affecting the whole world. In this paper, we introduce and apply two iterative methods, RMsDTM and R2KM, to obtain approximate values of Covid-19 cases in Morocco. We also compare the approximations of both methods and see that the solution of RMsDTM is more accurate.

Keywords: Morocco Covid-19 Infection Transform function Comparison
2020 MSC: 92C60, 92D30, 60G25

1. Introduction

Covid-19 is a highly infectious disease caused by novel Corona virus SARS-CoV-2. In the past, the novel coronavirus has emerged twice - SARS in 2003 and MERSCoV in 2012. However, the spread of the disease, unlike Covid-19, was limited to a smaller area. The first case of Covid-19 was observed in Wuhan, China, in December 2019. Since then, the disease has spread over almost all the parts of the world and was declared a pandemic by WHO on 11th March, 2020 [17].

Usually, Corona virus affects the respiratory tracts. The incubation period of this disease is 14 days. This virus is transmitted through aerosols or droplets from the nose or mouth of the infected person when the person sneezes,

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Anthology The Research

Sentiment Analysis: Construction and Applications of Sensitivity Index

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Abstract Sentiment Analysis is a quantitative tool used to assess the polarity of a document by the way of scaling on a multiway scale, it helps the analyst in finding author's attitude towards the topic. This paper is an attempt to fit in an index that can be used to rank references on a scale of 0 to 10, zero being least useful. We believe that is Sensitivity index is computed for a sufficiently large number of texts it can become instrumental in ranking texts according to their significance with respect to a certain topic. Assigning such ranks will fasten the pace of research and will be able to direct the researcher to the most relevant studies in research.

Keywords Sentiment Analysis, Polarity of Mentions, Indexation.

Introduction Sentiment Analysis has gained rapid popularity with the advent of machine learning, especially in areas of natural language processing. Though it is widely applied to understand the voice of customer and to read the survey responses, the essence of sentiment analysis is to classify the polarity of a given text at the level of document. Polarity of a document can be classified on a multiway scale or by scaling, on a multiway scale, search associated words are ranked on a scale of say 0 to 10 and while scaling, words commonly associated with having neutral, negative, or positive sentiments are scaled in order of severity of sentiment. Both these methods attach a value to the sentiment and makes it easy to work with it quantitatively. Sentiment analysis, opinion mining or emotional artificial intelligence as it may be referred to, helps the analyst in finding author's attitude towards the topic.

Objective of study The objective of this paper is to study of construction of the Sensitivity index.

Review of Literature Beginning with initial works of Turney (2002), Pang (2002) and moving on to more extensive later studies by various other authors and analysts we see an extensive use of techniques evolved in understanding movie reviews. We, however, seek to use the framework of this analysis for benefit of the researcher and research in varied fields. We believe that availability of such a framework would be instrumental in saving time and resources. If we have a framework that catches the sentiment or the intent of any writing it speeds up the research as it helps the researcher in zeroing in upon the most useful references. We propose to fit in an index that can be used to rank references on a scale of 0 to 10, zero being least useful. However, it must be understood that sentiments basically refer to feelings that are held in context, and thus any analysis of sentiments will turn out to be a value judgement. Even though we may assign numeric values to these judgements in the process of fitting an index, our intent remains only to rank them. This approach identifies more with the ordinal approaches as compared to the cardinal approaches.

Analysis

The first step in construction of the sensitivity index is to find out word sensitivity (S), for this we need to identify the target group of words/word and assign sensitivity value to it on a scale of 1 to 10 (one being the least sensitive or not sensitive). This gives us the Sensitivity scale {1 to 10} in whole numbers. The target word or the group of words is identified to be 'sensitive' only if the sensitivity value is greater than 1. Next, we assign a symbol 'S' to the sensitive word, where S is a direct function of assigned sensitivity say α.

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Impact of Labour Laws on Wage Differentials between Formal and Informal Sectors: Evidence from the Indian Manufacturing Sector

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Labor laws in India have been a subject of contention since their inception. There are arguments against labor laws that say that an adherence to labor laws push up the wages in the formal sector and reduce employability of the labor. A hike in labor cost makes capital relatively cheaper, causing an increase in capital intensivity of the production. This study is an attempt to show that labor laws are necessary and empirically proves that it is not the labor laws that create the wedges between the formal and informal sector wages. We econometrically test the hypothesis of there being a significant difference between wages in the formal and the informal sector and its correlation with existence of labor laws in the formal sector. The Oaxaca's decomposition technique is used to find out the difference in formal-informal sector wages that could be attributed to existence of labor laws. The results that we obtain show that 87 percent of the difference in wages between the formal and the informal sector is determined by the differences in income generating characteristics of the worker employed. We conclude that labor laws do not drive up the wages artificially, they just make employment more secure and worthwhile for the worker. We also point out the importance of public investments in human capital creation, underlining the fact that it is these investments that can reduce various inequalities among the wages of workers across employments and sectors.

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BUYBACK STRATEGIES OF CORPORATES: A REVIEW

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ABSTRACT

The repurchase of shares, or the purchase by a company of its own shares that it has previously issued, is one of the main tools of financial restructuring. When a company has surplus cash that it does not need in the medium term (e.g., in three to five years) and does not invest it at the expected rate of return, the company chooses to buy back securities, one of the methods of returning the surplus cash to shareholders. As mentioned earlier, corporate restructuring is undertaken by managers for a variety of motives, such as eliminating losses, increasing operational efficiency, focusing the business, and strengthening the market position. But protecting the interests of the company's owners, or shareholders, should be the manager's top priority. Do these structural alterations actually improve anything? This is a significant query that requires an answer. As a result, a lot of academics and researchers have tried to determine whether or not these corporate restructurings, which are carried out for a variety of reasons, actually accomplish this goal. In this paper by reviewing the existing literature an attempt has been made to study the various buyback strategies of corporates.

Key Words: Buyback, Indian Economy, Dividend, Stock Market

Introduction:

The development of the Indian economy is related to the rise of the Indian corporate segment in the last two to three decades and definitely after the opening up of the economy at the beginning of the last decade of the 20th century. The upsurge attracts companies from all over the world, in the context of capital. Securing and sustaining these funds depends on the ability of companies to meet the objectives of investors through their share price in the stock

BUYBACK OF SHARES: CONCEPTUAL FRAMEWORK

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ABSTRACT

For financial restructuring one of the major tools in hands of companies is to purchase or repurchase its own shares. This paper is a conceptual paper wherein concept of buyback of shares, history of buyback and various motives of buyback of shares are discussed. The main source of data collection is secondary. This paper is a result of review of different research papers, books, articles etc., collected from different sources.

Key Words: Buyback of Shares, Motives, Shareholders Valuation, Financial Restructuring

Introduction and Concept of Buyback of Share

The repurchase of shares, or the purchase by a company of its own shares that it has previously issued, is one of the main tools of financial restructuring. It is about the handling of capital, including decisions about its retention or disbursement. It refers to the change in a company's capital structure, i.e., the restructuring of a company's assets and liabilities in line with its cash flow needs, including share repurchase, unbundling, and debt restructuring. A share repurchase is an investment practice by a company in its own shares to reduce share capital or for treasury operations. In formal practice, the price of the shares is offset against issued capital and reserves and surplus for the value in over par value, while in subsequent treasury operation practice, the total share capital is not reduced as the shares purchased can be reissued to the public or for the employee share option scheme.

EEFECTS OF EMOTIONAL INTELLIGENCE ON PERSONAL FINANCIAL PLANNING OF HOUSEHOLDS

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Abstract

The prime objective of this study is to investigate relationship between emotional intelligence and personal financial planning of households. We have examined the direct and indirect effects of emotional intelligence being independent variable on financial planning of investor being dependent variable of the study. We used both primary and secondary sources of data collection as per the requirement. Convenient sampling technique has been applied to collect data from survey. Furthermore, descriptive statistical tools have been used to analyze primary data. The major findings of the study suggest that there is positive relationship between emotional intelligence and financial planning. Investors with a high EI aptitude are competent enough to control and manage their personal financial activities in an effective and efficient manner and a vice-versa. Sample size of the study is inadequate due to time and monetary constraints. For effective data collection and data analysis only head of the family that represents entire household's responses has been recorded. Future study can explore individual family member's contribution towards personal finance.

Keywods: Emotional Intelligence, Financial Planning, Households Investment, Financial awareness, financial system etc.

INTRODUCTION

In today's modern era the need of household's investment behavior is taking greater importance amongst the stakeholders because of few unrealistic conventional finance assumptions which has been proved irrational and illogical. Consequently such baseless theoretical assumptions have modified over the period of time. In this sequence personal finance of household is one of the emerging issues in the finance field. There are several factors that affect the financial decisions of household investors such as mental and physical health, emotional intelligence, personality traits, demographic variables (age, gender, education etc.) motivation, financial literacy, risk appetite, investment goals etc.

Hence we have observed many such other factors that little or more play an influential role for determining optimum portfolio of household investment. Therefore, it becomes quite significant to develop proper knowledge about household's investment strategies and habit. Furthermore, we must explore innovative tools and techniques to overcome upon investment hindrances and to increase household's participation rates in formal financial market. Most importantly regulators, policy makers and govt. must take cognizant to develop adequate organized financial setups to incorporate all the residents including marginalized section of the society under the same umbrella. Because we have came into notice that due to inadequate better to say

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ISSUES AND CHALLENGES TO FINTECH INDUSTRY IN INDIA

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India is a growing market for fintech. India is an exciting country since a significant portion of the population lacks access to banking services.

Fintech is viewed as a paradigm shifter and disruptive innovation that has the power to upend the established financial markets. In India, fintech has expanded quickly over the previous years and is anticipated to do so in the near future. The study begins by concentrating on the fundamental categories of financial technologies and their roles. It then goes on to analyse the Issues and challenges these technologies present in the Indian Financial System.

KEY WORDS: ***Financial Technology, Fintech, Financial Services, Indian Financial System, Business Finance***
JEL Code: G1, G2

INTRODUCTION

Fintech, the abbreviation for financial technology, refers to a sector made up of businesses that supply financial services effectively through the use of technology. In the twenty-first century, it is an emerging sort of service. By implementing technology in the financial sectors for mobile payments, loans, money transfers, and even asset management, new start-up businesses are attempting to replace the conventional transaction system with modern, efficient techniques.

Peer-to-peer lending, peer-to-peer payment technologies, digital wallets, blockchain, and mobile banking are a few further examples of how technology is being used in financial transactions. These seek to expand the benefits and achieve high financial transaction efficiency.

Additionally, they assist in lowering customer expenses.

FINTECH IN INDIA

With an ever-increasing reliance on information technology, the word "fintech" is used to characterise new technological breakthroughs in the financial services industry. Originally used to describe the back-end technology employed by major financial institutions, the phrase has come to refer to all technological advancements in the financial industry, such as those in financial literacy and education, retail banking, investing, etc.

One of the most significant trends expected to have an immediate impact on the global financial sector is technological innovation. The business models and

An Analysis of Legal Framework to Combat the Cybercrime (SAARC Countries)

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Abstract

Cybercriminals have a plethora of options to commit crimes and engage in other unpleasant activities due to the internet's current widespread use. Due to jurisdictional barriers and legal limitations, it is typically difficult to prosecute using contemporary judicial systems. Governments, businesses, and industries have all assumed the obligation to combat various forms of cybercrime. This paper examines what constitutes cybercrime and how law enforcement in SAARC nations has been able to address these crimes. The study provides a brief overview of the legal framework to prevent cybercrime in SAARC countries. The paper concludes with a discussion of the overall ineffectiveness of SAARC nations in combating the problem of cybercrimes, highlighting the intrinsic limitations and inadequacies of present legal approaches to cybercrime.

Keywords: SAARC Countries, Cyber Law, Cybercrime, Global Cybersecurity Index.

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A Comparative Study of Green Banking Initiatives Implemented by the Indian Banks

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ABSTRACT

Due to increasing industrialization, global warming and other environmental degradation have become critical issues. It is not an individual economic problem, but a global challenge, and rapid economic growth can only be achieved if every industry contributes to a sustainable environment. Banks can play an important role in contributing towards a sustainable environment and green world through green banking initiatives. Green banking means performing normal banking functions using environment-friendly technologies. In recent decades, there has been a worldwide emphasis on eco-friendly banking. India is likewise doing its best to promote environmentally responsible banking. The present paper is an attempt to assess the current condition of green banking in India and the manner in which Indian banks are prioritising sustainable development investment. In order to accomplish this objective, a comparison of two public and two private sector banks has been performed. In addition, this research also investigates the potential for green banking in India in the future. The study finds that Indian banks have expanded beyond just offering online services to include carbon neutralisation, support for environmentally conscious projects, waste management, and other relevant fields. It is suggested that there is still room for the promotion of additional green banking initiatives in India so that a variety of small banks can also make substantial contributions to green banking. The findings of the study may assist bank regulators and other regulatory bodies in determining the growth potential of green banking in India.

Keywords: *Banks, Green Banking, Carbon Neutralization, Sustainable Environment.*

INTRODUCTION

The expansion of economies has led to an increase in the prevalence of environmental issues like climate change, greenhouse gases, carbon emissions, global warming, and extremes of rainfall and drought. As a direct consequence of this, the standard of the environment deteriorates. The rate at which we are irresponsibly depleting the earth's resources raises the question of what kind of legacy we will be leaving for future generations. Therefore, the idea of sustainable growth while also protecting the environment has emerged as one of the most pressing concerns in the context of the global community. At the international level, different groups have tried to adopt strategies for sustainable development. Multilateral organisations,

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NPTEL- Technology Enhance Learning Initiative

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ABSTRACT

Education for a sustainable future is a topic of intense discussion around the world. In the twenty-first century, providing equal learning opportunities has emerged as a central goal for universities and colleges everywhere. New and innovative educational initiatives, such as Open Educational Resources (OERs) and Massive Open Online Courses (MOOCs), have arisen in recent years to satisfy the requirements of the world's expanding desire for knowledge. The National Programme on Technology Enhanced Learning (NPTEL) was founded in 2003 by the Indian Ministry of Human Resource Development (MHRD), seven Indian Institutes of Technology (IITs), and the Indian Institute of Science (IISc), to provide undergraduate students with access to courses in all of the major engineering and physical science disciplines. The purpose of this paper is to evaluate NPTEL's effectiveness and investigate its efforts to expand its course offerings. The study concluded that NPTEL facilitates creative and inventive thinking, and interactive learning, and satisfies specific learner requirements.

Keywords: NPTEL, SWAYAM, MOOCs

INTRODUCTION

Presently, the entire globe is discussing sustainable education for sustainable living. Accessible and equitable teaching opportunities are the foundation of a sustainable educational system. In addition, providing the learners with the necessary knowledge, training, and skills to be truly productive. Sustainable education would equip people with the information, abilities, and values essential for creating a future that can support human flourishing for generations to come. Higher education institutions around the world have made it a top priority in the 21st century to ensure that all students have access to quality education. Learners, however, deserve the chance to participate in high-quality programmes tailored to their interests and skill sets, ensuring that they gain the most from their educational experiences. Therefore, it is essential to determine whether the education and training are truly focused on learners' needs and adequately skill-oriented to provide them with a minimal quality of living. As a result, government initiatives in education may play a pivotal role in modernising curricula to accommodate students' requirements in the twenty-first century. In light of this, the government in a country like India are currently debating how education may be made skill-oriented, enhancing the capacities of students and preparing them to become productive citizens in the future. Developed countries have become the epicentre of world-class education due to their judicious use of online curriculum transmission and focus on more realistic educational goals. However, a growing nation like India still faces various difficulties in its efforts to provide everyone with a quality education. Regarding education, India still has many unanswered concerns, such as if the quality of education could be attained; if the inequalities in accessing education can be eliminated, and if new educational initiatives in the form of Massive Open Online Courses (MOOCs) can bring forth opportunities for persistence and reasonable learning. Open Educational Resources (OERs) and Massive Open Online Courses (MOOCs) are the new and modern educational interventions that have emerged in recent years to meet the needs of the world's increasing desire for knowledge. Numerous policies and initiatives have been developed by the Ministry of Human Resource Development to encourage the widespread adoption of massive open online courses (MOOCs) to provide accessible, high-quality education at a low cost to India's large and diverse population.

Technology Enhanced Learning and Teaching (TELT) is a pedagogical framework for the development of educational content and an interactive information exchange system that delivers supplementary learning through interactions. Enabling, educating, and empowering each citizen and community through knowledge is the guiding principle of the TELT programme, which aims to provide quality education to all students regardless of their location. The approach is supported by a web-based e-learning platform that provides the scope of instructions for both students and teachers, facilitating more efficient two-way communication and education. The model was designed with the following objectives in mind:

1. Learning is the process of developing the ability to see abstractions, recognise patterns, make informed judgments, and take appropriate action.
2. Instructional objectives provide students with a sense of purpose, motivation, and direction.
3. Real-world activities should be incorporated into the instruction process.

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Cryptocurrency with Special Reference to Bitcoins: An Indian Perspective

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Abstract

A significant number of activities have been moved online because of the quick development of communication technology. Subsequently, these activities have become more versatile and proficient. The growth in the number of individuals utilising the web has led to the thought of a virtual world with other business peculiarities known as cryptographic forms of money in order to empower money-related activities including purchasing, selling, and exchanging. Since virtual money isn't dependent upon similar degrees of oversight and guideline as conventional monetary standards, most countries have decided to prohibit it from their financial frameworks. This paper investigates the ongoing legitimateness of cryptocurrency in India and the impact of potential government activities on these monetary standards. The study also focuses special attention on Bitcoins by analysing the history, pros and cons, development, and legal status of Bitcoins in India.

Keywords: Cryptocurrency, legality, RBI, Bitcoin.rn, Standard deviation, Beta, Coefficient of Variance.

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GREEN BONDS: SUSTAINABLE FINANCING PRACTICES IN INDIA

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ABSTRACT

Preserving our planet's environment has risen to the top of today's global priority list. Each nation has begun taking deliberate steps in this direction, however large or small, and has also cooperated with others to protect the planet's temperature and environment. Corporations are shifting their attention to greening the business process as a means of providing environmental viability. The same holds true for the financial sector, where ecological concerns have become central to the role of financial administration. Green bonds have been issued by a variety of Indian institutions beginning with Yes Bank in 2015. The energy industry is the primary target of the bonds. In order to reduce its carbon footprint, India has set ambitious goals, including expanding its use of green energy and boosting its efficiency. Green bonds have many positive social impacts, including promoting climate justice and ecologically friendly development. As the Indian government commits more resources to renewable energy and environmental protection, the country's green bond issuance is expected to rise and play an increasingly important role in India's sustainable growth. The paper makes an effort to describe the features of green bonds that make them a practical option, especially in the Indian setting. Additionally, the paper examines the present policy landscape and makes suggestions for further developing India's green bond market.

Keywords: *Green Bonds, India INX, Sustainable Finance.*

Introduction

Our planet's environment is in dire need of rescue at this point. Each country has started taking active steps in this direction, no matter how big or small, and is working together with others to prevent further damage to the climate and the planet. Because of this, green bonds have emerged as a novel way to put money to work. Green bonds, as the name implies, are debt instruments issued to fund or refinance initiatives that benefit the environment and the climate. The term climate bond is another name for these financial commitments. "After the Paris Agreement in 2007, the World Bank initiated the issuance of green bonds, and by 2023, it is predicted that the global yearly issuance of green bonds will reach up to US$1 trillion"(International Finance Corporation, 2022). After China, India is the biggest developing market for environmentally friendly bond issuance. In the current economic climate, green projects enjoy a lot of attention and support, and this is proving to be a winning formula for luring foreign investors. For India in particular, achieving carbon neutrality will require massive investment in green bonds—roughly US$ 10 trillion. However, green bonds are an improvement that helps both buyers and the environment. "Sovereign green bonds will be issued as part of the government's total market borrowings in the Union Budget for 2022-23 to mobilise resources for green infrastructure"(Press Communique, 2022). In order to lower the carbon intensity of the economy, the government plans to invest the money it receives from the sale of green bonds in ecologically friendly and long-term projects. In contrast to the long history of corporate green bond issuance, sovereign green bond issuance is a more recent occurrence. Poland released the first-ever green sovereign bonds in 2016. "Sovereign green

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CENTRAL BANK DIGITAL CURRENCY (CBDC): A GLOBAL PERSPECTIVE

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Abstract

With the rapid development of technology, many countries have adopted or intended to implement digital money as a means of exchange. These digital currencies will be held centrally by the nation's central bank and be accepted as legal tender. The introduction of digital currency will make all significant transactions transparent and accountable. CBDC (Central Bank Digital Currency) could potentially pave the way for the rapid and low-cost internationalization of payment systems. The research paper attempts to investigate the three stages of the global trends in digital currencies across nine different countries. India is in the second stage, which is pilot testing the digital currency in the country. The present study further explains the differences between digital currency, cryptocurrencies, and UPI payments.

Keywords Central bank digital currency, Demonetization, Cryptocurrency, UPI payment, RBI.

1. Introduction

Massive amounts of data can now be gathered, handled, and transmitted easily and quickly because of the convergence of improved digital technology and expanded use of the internet. Digital technology has also changed the financial system. Despite the fact that information technology and communication have been improving for a very long time, the last ten years have seen a number of significant developments. The Covid-19 pandemic may have sped up technological development even more (Ozili 2022). As a result of these developments, various central banks and governments have intensified their efforts to explore the prospect of developing a digital form of fiat currency.

CBDC (Central Bank Digital Currency) is a form of digital or virtual currency issued by the central bank. CBDC although has no physical manifestation as opposed to paper currency but could serve as a viable alternative to conventional physical currency. It utilises online accounting and transfer systems to keep track of transactions. Thus, digital money, like its monetary equivalent, serves as both a unit of account and a medium of exchange. When compared to physical cash, CBDC has the advantage of streamlining the entire monetary transaction. In light of these benefits, numerous national governments have prioritised the shift to digital currency, and the popularity of CBDC has surged in recent years.

According to the concept note on CBDC issued by RBI (Reserve Bank of India) in October 2022 "As of July 2022, there are 105 countries in the process of exploring CBDC, a number that covers 95% of global Gross Domestic Product (GDP). Ten nations have issued CBDC, with the first being the Bahamian Sand Dollar in 2020 and the most recent being

Central Bank Digital Currencies (CBDC): Trends And Future Research

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Abstract: *In recent years, many countries have shown their interest in Central Bank Digital Currencies (CBDCs) due to the quick technological advancements taking place in the financial world. The term digital currency refers to the digital representation of a country's fiat currency issued and regulated by the central bank. Ten countries including India have already launched their CBDCs. The first digital currency was the Bahamian Sand Dollar launched by Bahamas in October 2020. There is a strong need to investigate the potential for the development of CBDC and its impacts on national monetary policy. The present study examined the research trend in the field of CBDCs from 2018 to 2023 with the help of bibliometric data extracted from the SCOPUS database. Biblioshiny and VOSviewer techniques are used to understand the evolution of the topic. The study identifies the most important publishing source, the most contributing author, and their collaborations. It also presents developing areas of study in central bank digital currencies through keyword analysis of the retrieved literature.*

Keywords: *Cryptocurrency, Central bank digital currency, Central Bank, Bibliometric analysis.*

Introduction

Digital technology has changed the financial system. Despite the fact that information technology and communication have been improving for a very long time, the last decade has seen a number of significant developments. The Covid-19 pandemic may have sped up technological development even more (Ozili 2022). As a result of these developments, various central banks and governments have intensified their efforts to explore the prospect of developing a digital form of fiat currency. CBDC (Central Bank Digital Currency) is a digital or virtual currency issued, monitored and controlled by a country's central bank. Since its introduction, the CBDC system has been the topic of extensive discussion and research within the financial industry. Many countries have started developing their very own digital currencies to be issued by their central banks. The Central bank will recognise digital money as a valid form of payment and regard it as legal tender. The world is headed toward a future with a digital economy and a future that uses digital currency (Ian Smith 2022). In October 2020, the Bahamas introduced the Sand Dollar, the world's first digital money. Since then ten nations, including India, have introduced CBDCs in their own country. There is a need to examine the state the of CBDC study, as well as its prospects for future development, and how they might affect national monetary policy.

RESEARCH OBJECTIVES

The present study has the following specific objectives:

1. To recognise the most influential journals publishing on CBDC,
2. To identify the top contributing authors and countries in the field of CBDC studies and their collaboration.
3. To discover the most used keyword in the CBDC studies.

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ROLE OF BIG DATA ANALYTICS IN FINANCIAL FRAUD DETECTION- A BIBLIOMETRIC ANALYSIS

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Abstract

Using data analytics and machine learning to combat fraud is a strategy that many businesses have already considered. Fraud may be detected, investigated, and prevented with the aid of big data analytics and machine learning. The purpose of this research is to systematically review the 219 Scopus-indexed publications in context of data analytics in detecting financial crime during 1999 to 2022. The findings indicate that a significant portion of the literature focuses on the utilization of big data analytics, specifically machine learning and deep learning techniques, for the purpose of detecting credit fraud or financial statement fraud. Previous studies have primarily concentrated on the utilization of hybrid technology in the realm of financial fraud detection, thereby indicating its potential as a promising avenue for future research. This study highlights the prominent research gap existing for a predictive model that can issue a warning as soon as a vulnerability for fraudulent behavior is noted. Moreover, findings highlight the accentuated need for data-driven financial investment model and stock market anomalies in context of data analytics and text mining, along with key future research agenda.

Keywords: Financial Fraud Detection, Big Data, Big Data Analytics, Machine Learning, Deep Learning, Bibliometric Analysis

JEL Classification: G3, G320, C8, C55, D83

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Photogravitational magnetic-binary problem with oblateness and belt of material points

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ABSTRACT

We study the motion of a charged particle in the framework of magnetic-binary problem where the bigger primary is the source of radiation and the smaller primary is the oblate body; and they are enclosed by a homogeneous circular truss of material points centered at the center of mass of the system. We have determined the equations of motion that govern the motion of a charged particle. The coordinates of collinear and non-collinear equilibrium points and their linear stability have been calculated. Numerical results reveal that the ratio of magnetic moment λ has a huge impact on the location, stability and orbital dynamics of the problem. We observed that there exists eight, eleven and thirteen equilibrium points for different values of mass parameter μ and the ratio of magnetic moment λ. Further, we observed that all non-collinear equilibrium points are unstable in the Lyapunov sense. But the collinear points L_4 and L_6 show a stable behavior for some values of μ and λ, while other collinear equilibrium points are unstable. The geometric configuration of zero velocity curves of the charged particle is numerically simulated and addressed. Moreover, first order approximations to a Lyapunov and Lissajous orbits are summarized near the collinear equilibrium points under the effect of λ.

1. Introduction

In the field of *Celestial Mechanics and Space Dynamics*, the dynamical systems model so called n-body problems ($n \geq 3$) are very significant for stellar dynamics, predominantly prominence in space missions. In the configuration of a restricted three-body problem, the system consists of two massive primaries ($m_1 > m_2$) that move under their mutual gravitational forces, and the third primary is an infinitesimal mass body. The third primary moves in the plane of the primaries and is attracted by them and influenced by their motion but does not influence them. In the classical case, the gravitational forces are considered and it is found that there are five equilibrium points (two are triangular and three are collinear). The collinear equilibrium points are unstable and on the other hand the triangular equilibrium points are stable for the critical mass parameter (Szebehely, 1985). We study different aspects such as equilibrium points and their stability, zero velocity curves, periodic orbits, Poincare section and so forth in these models. The restricted three-body problem is a well-known problem in the field of *Celestial Mechanics and Space Dynamics* and its excessive theoretical, practical, antique and scholastic weight. The restricted three-body problem has been studied by many mathematicians, astronomers and scientists in different aspects in the last six-decades. Dragt (1965) has worked on trapped orbits in a magnetic dipole field. Pars (1965) has written a book 'A Treatise on Analytical Dynamics'.Stormer (1907) has studied the motion of a charged particle in a magnetic-dipole field. Marvaganis (1978) has laid the foundation of the magnetic-binary problem, that is, the study of a charged particle behavior in a magnetic binary system. After this study, Marvaganis (1978) has investigated the influence of the primaries with oblateness on the stationary state of the planar magnetic-binary problem. Mavraganis (1980a,b) has studied equilibrium points in the planar magnetic-binary problem. Mavraganis (1980a,b) has worked on the periodicity of a charged particle motion in a magnetic dipole field. Mavraganis (1981) has studied the equilibrium state and their stability of the planar magnetic-binary problem when the more massive primaries is an oblate spheroid. Mavraganis and Jupp (1990) have worked on the rotating magnetic-binary problem: a new realistic description of magnetic-binary systems. Kalvouridis (1991) has studied three-dimensional equilibria of magnetic-binary systems with oblate primaries. Desiniotis and Kazantzis (1993) have studied the areas of motion in the three dipole problems. Jain et al. (2006) have

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GRACEFUL LABELING OF CLOSED CATERPILLARS

AJAY KUMAR, AJENDRA KUMAR, VIPIN KUMAR, TARUN KUMAR GUPTA, AND DIPA SHARMA

Abstract. For the sake of simplicity, we emphasize on simple, connected and finite graphs. After a long period of scramble over analysis and investigations, the notion of graceful labeling came into existence and therefore the credit goes to Rosa (1967) and then by Golomb (1972) for the first definition of graceful labeling. If there exists a bijective mapping $f : V(G) \to \mathbb{N} \cup \{0\}$ such that each edge $e \in E(G)$ has the induced label $\omega(f, V(G)) = \{|f(u) - f(v)| : u, v \in V(G)\}$ and $min\,\omega(f, V(G)) \leq \omega(e) \leq max\,\omega(f, V(G))$ such that the resulting edge labels are distinct, then f is said to be graceful labeling for the graph $G = (V, E)$. In this paper, we develop a new operation " super-imposition" for joining two smaller graphs by which we can obtain a new larger graph. By this operation, we generate a new graph from a caterpillar $P_n \odot K_1$ and call it closed caterpillar. We prove that all closed caterpillars admit graceful labeling. We also conjecture that all two sided closed caterpillars have graceful labeling.

1. Introduction

Any graph $G = (V, E)$ use in this paper is simple, connected and finite. We have had a lot to say so far about graceful graphs but what about the graphs obtained from smaller graceful graphs? After a long period of scramble over analysis and investigations, the notion of graceful labeling (β-valuation) came into existence and therefore the credit goes to Rosa [14] and then by Golomb [8] for the first definition of graceful labeling. If there exists a bijective mapping $f : V(G) \to \mathbb{N} \cup \{0\}$ such that each edge $e \in E(G)$ has the induced label $\omega(f, V(G)) = \{|f(u) - f(v)| : u, v \in V(G)\}$ and $min\,\omega(f, V(G)) \leq \omega(e) \leq max\,\omega(f, V(G))$ and the resulting edge labels are distinct, then f is said to be graceful labeling for the graph $G = (V, E)$. A graceful labeling with the property that there exists an integer k so that for every edge $uv \in E$, either $f(u) \leq k < f(v)$ or $f(v) \leq k < f(u)$ is called α - labeling (or α - valuation) [14]. An α - valuation and β - valuation of n-gon exists if and only if $n \equiv 0\ (mod\ 4)$ or $n \equiv 0\ or\ 3\ (mod\ 4)$ respectively made by Rosa [14]. A similar result made by Habbare [10] for cycles C_n that C_n is graceful if and only if $n \equiv 0\ or\ 3\ (mod\ 4)$.

A new operation between two graphs G_1 and G_2 is presented by Frucht and Harary [6]. They called this operation corona between G_1 and G_2 as follow: the corona $G_1 \circ G_2$ of the two graphs G_1 and G_2 (where G_1 has p_i points and q_i lines)

2000 *Mathematics Subject Classification.* 05C78.
Key words and phrases. graceful labeling, path, caterpillar, closed caterpillar, two sided closed caterpillar.

Neutrosophic Monte Carlo Simulation Approach for Decision Making In Medical Diagnostic Process Under Uncertain Environment

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Abstract

This work emphasis on the basic notions regarding the Neutrosophic Fuzzy Sets (NFSs) with operations and their applicability in medical diagnostic process. In this manuscript, we developed neutrosophic fuzzy set-based Monte Carlo simulation technique for the decision making in medical diagnostic processin fuzzy environment. In this work, we managed the waiting time and idle time of the doctor during the treatment process of the patients. The various parameters are stated as linguistic variable in the form of NFSs. The developed neutrosophic Monte Carlo simulation technique (NMCST) is extended in the planning strategy of a doctor to treat the patient in a neutrosophic fuzzy environment. For the validation and authentication of the efficiency of the proposed NMCST, numerical computations are carried out with the examples of medical problems.

Keywords: Neutrosophic Fuzzy Sets (NFSs); Monte Carlo Simulation; Neutrosophic Fuzzy Set-based Monte Carlo Simulation Technique (NMCST); Medical Diagnostic Process

1. Introduction

Uncertainty is a common thing in every field of the life. It results from a loss of control over a certain event and can be observed in any area of life (for example, in any laboratory experiment, any sport, Medical, War, etc.). Generally, it is perceived that uncertainty can cause only havoc for the systems having only solution is right decision making in uncertain situations. During Second World War, Neumann and Ulamdeveloped the Monte Carlo simulation technique to tackle the decision making in ambiguous situations. This method is also known as Monte Carlo simulation method. It is a procedure for evaluate a variable based on one or more random factors. It is used in various fields such as marketing estimation, radiation therapy etc. Concato and Feinstein [1] analyzed that the Monte Carlo simulation offer attractive methods for clinical investigators to use in solving various problems. Abbas et al. [2] studied various simulation models for recruitment of patients in clinical trials with respect to the continuous as well as discrete time assumptions. It was found that continuous time simulation can reduce the duration of patient recruitment.Many researchers continued this concept in research of this field.Young-Jin Kim [3] pointed out that fuzzy Monte Carlo simulation is an important tool for reducing the uncertainty and global sensitivity analysis in any field. Sarrut et al. [4] studied the use of artificial intelligence approach in Monte Carlo simulation in various medical fields. Sharma et al. [5] used Monte Carlo simulation technique for evaluating the reliability of complex systems.

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Color and Psychological Functioning with LSTM: The Impact of Colors on Emotional Quotient

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Abstract

Artificial Intelligence (AI) has become a crucial component of every industry in today's globe. As the demand for computerized intelligence grows, emotional intelligence is perceived and employed by the machine, paving the door for an emerging novel study known as orange computing for humanistic care applications. Through this study, we hope to discover a link between color perception and human emotion, which will aid numerous industries in branding, advertisements, communications, human resource development, and, lastly, promoting societal mental wellness. We propose employing natural language processing, sentiment analysis, opinion mining, and different frequently used classifiers such as Long Short-Term Memory (LSTM), Support Vector Machine (SVM), and Nave Bayes (NB) to work on this. In the future, this method might be used to a larger dataset to explore human behaviour and its distinctive reliance on colours on a broader scale, defining colour technology.

Keywords: Long Short-Term Memory (LSTM), Color Computing, Natural Language Processing (NLP), Machine Learning, Sentiment Analysis, Innovation,

1. Introduction

Humans are unique among living things because they can reason, form ideas, and experience emotion. Understanding people necessitates gaining insight into the inner workings of the human brain, as well. Everything from the components responsible for movement and action to the parts that process sensory information and make decisions, and most crucially the part that feels. Emotions are the root cause of some of humanity's most convoluted experiences. Understanding human behaviour necessitates a thorough understanding of the function that emotions play in it. Every person has his own unique way of expressing their feelings and emotions. Emotions are not exclusive to the human species; animals of all kinds experience them as well. Anger, disgust, fear, sadness, anticipation, joy, surprise, and trust are the fundamental emotions. Other feelings include sadness, fear, and surprise. Emotions, which can at times feel confusing and overwhelming, benefit from this type of framework since it helps to bring clarity to them.

The complexity that surrounds feelings is only going to increase as a result of the fact that there are a variety of feelings that may be broadly categorized as either positive, negative, or neutral. This first categorization is utilized rather frequently whenever sentiment analysis, opinion mining, or any other type of Natural Language Processing (NLP) algorithm is being carried out. To provide a bit more context, states of mind such as joy, enthusiasm, and excitement are examples of what are categorized as positive emotions. Negative emotions include things like sadness, wrath, contempt, and fear, among others. Neutral emotions, on the other hand, are those that cannot be definitively categorized as either positive or negative. Examples of neutral feelings include boredom and distraction, among other things. This categorization is the foundational building block for comprehending human emotions (Boyatzis & Varghese, 1994) [14] and, by extension, human behaviour.

1.1 Colour Psychology

Colours have been known to be correlated to emotions in some form or the other. It is often said

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Fuzzy Reliability Analysis of a Multi-Chiller System based on Modern Analytics

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Abstract: Cooling systems are important part of our day-to-day life in summer season. In cooling systems, most challenging part is to consume the less energy with longer reliability. A multi-chiller system is analyzed in the present work. In the present problem, a fuzzy logic-based approach is used to evaluate the fuzzy reliability of multi-chiller system. The reliability of a multi-chiller system depends upon the failure with the partial (part) loading ratio (PLR). PLR is taken as fuzzy parameter in this work. In this work we also compared the results of the approach Lagrangian Method (LGM), Genetic algorithm (GA) and Teaching learning-based optimization (TBLO) with our proposed approach.

Keywords: Fuzzy logic, Fuzzy failure rate, Partial load ratio (PLR), Multi-chiller system, Fuzzy reliability.

1. Introduction

A system is made up of many components or subsystems. Therefore, failure of any component or subsystem may lead to the system performance or its working capacity. Sometimes, system may be in completely fail state. The failure of systems affects the reliability. The reliability of systems is always being the topic of interest.There are many complex systems in various industry/factory, institutions and home appliances, which can be made more reliable using new methods/techniques.A chiller is responsible to remove heat from a liquid by absorption cycle or vapor compression. A chiller system is the main unit/part of our cooling systems like air conditioners and refrigerators. In multiple layered chiller system, there are two or more chillers

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Innovation adoption modeling incorporating market expansion and change point attribute

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Abstract. Today, in an era of high technological products, the rate of innovation and knowledge creation plays a pivotal role in continued firm growth. In the last few decades, it has been observed that the world of product development and its management has evolved rapidly. In particular, the use of feature-addition or otherwise bringing some change in the marketing strategy after a certain time point (change point) is fast becoming commonplace. These attributes like: entry/exits of the competitor, change in price, change in quality, environmental changes, etc. tend to bring a remarkable change in the overall sales of an existing product mix. Many innovation diffusion models have been proposed over the past three decades that estimate the sales but very few models have considered the increase in market size after this strategic time point named as change point in marketing literature. The objective of this paper is to propose the innovation adoption modelling framework that incorporates this effect of increase in the market size. Results have been supplemented with numerical examples.

1 Introduction

In todays technological world, many products are launched everyday but only a few products capture the market. There are many factors that affect a product's performance in the market. Diffusion of innovation plays an important role in the success of a product [1]. There are mainly four key elements

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Keywords: Change Point; Dynamic Market Size; Innovation Adoption; Market Expansion.

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THE BICOMPLEX LAPLACE TRANSFORM OF RIEMANN-LIOUVILLE FRACTIONAL OPERATORS: PROPERTIES AND IMPLICATION

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Abstract: This article discusses Riemann-Liouville integrals and differentials of bicomplex order in terms of bicomplex Laplace transform. Analyzing bicomplex Laplace transforms of mixed type operators (composition of bicomplex order and integer order integral and differential operators), we obtain several important results. By using the obtained results, we obtain the solution of an initial value problem for a non-homogeneous fractional differential equation equipped with the Riemann-Liouville differential operator of bicomplex order.

AMS Subject Classification (2010): 30G35, 26A33, 33B15.

Keywords and phrases: Bicomplex Laplace transform, Idempotent representation, Bicomplex gamma and beta functions, Riemann-Liouville operators of bicomplex order.

1. Introduction

The theory of bicomplex numbers has been the subject of active research for a long time since the fundamental work and discovery of this special algebra. The algebra of bicomplex numbers is widely used in the literature because it becomes a viable commutative alternative to the non-skewed field of quaternions introduced by Hamilton, since both are four-dimensional generalization of complex numbers. Various integral transforms are indispensable tools for discussing solutions of integer as well as fractional order differential equations viz. Laplace transform, double Laplace transform, triple Laplace transform, Laplace-Stieltjes transform, Fourier, Fourier-Stieltjes transform, Hankel transform, and Mellin transform etc.

A bicomplex extension of these integral transforms along with their various important properties and applications were discussed in [1-6, 16, 17, 24]. In the past decades, fractional calculus has become the focus of many research studies. Its value is not limited to just an interesting mathematical object, it has many applications for other sciences such

ISSUES AND CHALLENGES TO FINTECH INDUSTRY IN INDIA

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India is a growing market for fintech. India is an exciting country since a significant portion of the population lacks access to banking services.

Fintech is viewed as a paradigm shifter and disruptive innovation that has the power to upend the established financial markets. In India, fintech has expanded quickly over the previous years and is anticipated to do so in the near future. The study begins by concentrating on the fundamental categories of financial technologies and their roles. It then goes on to analyse the issues and challenges these technologies present in the Indian Financial System.

KEY WORDS: ***Financial Technology, Fintech, Financial Services, Indian Financial System, Business Finance***

JEL Code: G1, G2

INTRODUCTION

Fintech, the abbreviation for financial technology, refers to a sector made up of businesses that supply financial services effectively through the use of technology. In the twenty-first century, it is an emerging sort of service. By implementing technology in the financial sectors for mobile payments, loans, money transfers, and even asset management, new start-up businesses are attempting to replace the conventional transaction system with modern, efficient techniques.

Peer-to-peer lending, peer-to-peer payment technologies, digital wallets, blockchain, and mobile banking are a few further examples of how technology is being used in financial transactions. These seek to expand the benefits and achieve high financial transaction efficiency.

Additionally, they assist in lowering customer expenses.

FINTECH IN INDIA

With an ever-increasing reliance on information technology, the word "fintech" is used to characterise new technological breakthroughs in the financial services industry. Originally used to describe the back-end technology employed by major financial institutions, the phrase has come to refer to all technological advancements in the financial industry, such as those in financial literacy and education, retail banking, investing, etc.

One of the most significant trends expected to have an immediate impact on the global financial sector is technological innovation. The business models and

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Wahid

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Soil Carbon Sequestration Potential of Terrestrial Ecosystems: Trends And Soil Priming Effects

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Abstract

Carbon sequestration in the terrestrial ecosystems by forest and agricultural management activities is being considered the best sustainable method to diminish the increasing concentration of atmospheric carbon dioxide (CO_2). This paper presents soil carbon sequestration potential of terrestrial ecosystem and the concept of soil priming effect. According to forest survey of India, the carbon stock of Indian forests increased at the rate of 0.3% as compared to the previous assessment, i.e., from 2017 to 2019. Indian forests soils are a reservoir of 7124.6 million tonnes of carbon and they still have high potential to store more carbon. As per soil carbon 4 mille concepts, India must intensify the process of afforestation, land restoration, and agricultural management practices to increase the soil carbon storage, i.e., up to 0.4%. However, organic manure amendments or a fresh supply of carbon substrates via. rhizodeposits into the rainfed or irrigated lands changes the microbial communities and may decompose the already stored soil carbon, i.e., positive priming effect. Thus, accurate measurement of soil organic carbon (SOC) content in various types of ecosystems like forest, agricultural land, desert, agroforest, and plantation is still crucial to ascertain how much they can help to reduce the increasing concentration of atmospheric CO_2.

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Forests;
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Priming Effect;
Soil Carbon Sink;
Terrestrial Ecosystem.

Introduction

The concentration levels of carbon dioxide (CO_2) in the atmosphere plays a precarious role in maintaining the global surface temperature.[1,2] The level of atmospheric CO_2 concentration is increased at alarming rate after the industrial

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REVIEW ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

An Overview of COVID-19 PAN India

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Abstract

COVID -19 is a highly contagious viral disease that affects human populations very differently ranging from mild-to-moderate flu-like symptoms to serious complications involving mainly the respiratory system. The causative pathogen is a new virus Severe Acute Respiratory Syndrome Coronavirus 2. The viral disease gripped millions of lives in a short span, due to which World Health Organization announced it as pandemic on March 11, 2020. Various measures were adopted at local and global levels to stop immediate escalation of the viral infection. A complete lockdown was imposed, movement was restricted, industries were shut down, vehicles were prohibited to ply; only the production and supply of essential services were permitted. On one hand, the fatal disease posed a serious threat to life and quarantine caused loneliness but on the other hand, such unprecedented crisis had a positive impact on overall healing of nature. The economy and health infrastructure of various countries collapsed in fighting the pandemic. To revive, switching over to green economy may be the most viable option and it will also be a climate-conscious approach. The current review article gives an insight about COVID-19 pandemic and fight against it from India's perspective.

Keywords: AY.4.2 variant, COVID-19, Endemic, Pandemic, Psychological health, Social consequences, Vaccination

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Introduction

COVID-19 is coronavirus disease caused by the novel coronavirus known as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). The viral disease being contagious spread so very fast across the globe that it was announced as pandemic on March 11, 2020, by the World Health Organization (WHO). It was first time reported in December 2019 from Wuhan, a city in China. Similar, pandemics reported in the past, in 2003 and 2012 were caused by the same family of viruses SARS-CoV-2.[1,2] Coronaviruses belong to the genus *Coronavirus* –the largest group of viruses. They are typically round, enveloped, single-stranded, positive-sense, RNA viruses with spike proteins on their surface which gives them a crown-like appearance that helps in the attachment of virus.[3] Multiple new mutant strains were also reported, out of which few strains were variants of concern (VOCs; variants that have higher transmissibility, increased virulence, or decreased susceptibility to available diagnostics, vaccines, and therapeutics) and some were variants of interest (VOIs; strains which have caused community transmissions and are suspected to be detrimental). VOCs include strains of different lineages that belong to various countries. WHO labeled the strains as alpha, beta, gamma, and delta that originated in countries such as the United Kingdom, South Africa, Brazil, and India respectively. VOI identified by WHO as Eta was reported from many countries, Iota from the USA, Kappa from India, and Lambda from Peru.[4]

India's first COVID-19 case was a student from Kerala who had returned from Wuhan in January 2020.[5] Two months later the first loss of life owing to COVID-19 from Karnataka was reported on March 12, 2020. With the escalation of COVID-19 cases, Janata (public) curfew was enforced on March 22, 2020, which was foundation of the nationwide lockdown imposed from March 25, 2020, to May 31, 2020. Eventually, phase reopening began after 75 days of lockdown from June 8, 2020, onwards. Unfortunately, a second wave, more severe wave of coronavirus hit the country and a second lockdown was imposed in April 2021. During this timeline of pandemic events and the consequences thereupon; undoubtedly affected nation's economy, social life, and mental health. Although India ranks second in population in the world yet it managed to tackle initial wave of COVID-19 pandemic quite efficiently. The mortality rate was low despite encountering higher number of COVID-19 cases and insufficient medical facilities. Mostly people with comorbidities such as hypertension, diabetes, cardiovascular dysfunction, kidney failure, and chronic obstructive pulmonary disease lost their lives due to COVID-19.[6] As comorbidities increase with age; elderly people were more susceptible to the virus. A plausible explanation for low mortality rate may be that majority of India's population comprises younger age group. The second wave, however, completely changed the scenario, as there was a sharp escalation in COVID-19 cases that led to a severe shortage of beds in hospitals and medical oxygen which created a grave situation, and 38,000 deaths were reported in April 2021.[7]

India being the second most populated developing country with more than one billion people, the fight against COVID-19 was extremely challenging. The vigilant government of India (GoI) took

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Research Article

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Diversity of fungal endophytes at different maturity levels of *Cryptolepis buchanani* leaves

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ABSTRACT

A study on endophytic microflora diversity at each level and portion of the leaves of *Cryptolepis buchanani*, a medicinal plant used by tribals of Madhya Pradesh, India was carried out in the present investigation. As many as 383 isolates from 360 discs of leaves belonging to 17 fungal species and 9 isolates, which did not show any sporulation (sterile), were recovered. Among the 17 identified species, hyphomycetes is the dominant class and *Aspergillus, Colletotrichum and Khuskia* are the dominant genera. Colonization frequency (CF) was higher in mature leaves (78.3%) and comparatively lower in younger leaves (51.1%) and there was a marginal decrease in CF from the base of the leaf (66.7%) towards the leaf apex (62%). Statistical analysis revealed that level of the leaf had a significant effect on CF and diversity of fungal endophytes, while as leaf sub-parts had little influence. Biochemical characterization of the endophyte revealed the production of various enzymes viz. protease, amylase, lipase, cellulase, xylanase and pectinase. These fungal enzymes can be tapped for food, pharma, beverages, textiles, confectionaries, and leather industries. These bioactive natural products are easy to process as they are usually more stable than products obtained from other sources. The enzymatic activities also help to get a better insight into the host-endophyte relationship. However, the world of fungal endophytes needs to be researched extensively for production of plant based novel eco-friendly biomolecules in cost-effective manner.

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KEYWORDS: Fungal endophytes, *Cryptolepis buchanani*, Medicinal plant, Leaf diversity

INTRODUCTION

Microorganisms are cosmopolitan and live in almost every perceptible niche on this planet. The microorganisms that inhabit plants are known as 'endophytes'. Endophytes are a fascinating group of microorganisms which are a subject of increasing interest to mycologists, plant pathologists, and ecologists (Schulz & Boyle, 2005). They usually live in the cells internally and it is interesting to note that the host plants remain symptomless (Bacon & White, 2000). The endophytes include an aggregation of microbes that perform different functions. After an endophytic phase of growth, these may grow as saprophytes on dead decaying plant matter, as latent pathogens and virulent pathogens. The host plant essentially gives sustenance and refuge to the endophytes and in turn gets increased hardiness from endophytes which produce unique utilitarian compounds (Tan & Zou, 2001).

Endophytes are hidden within the host plants, so they have been poorly investigated microorganisms. They are less explored as sources of natural products which can be exploited for medical and commercial use. The bacteria, fungi, and protists form a very mixed microbial body living as endophytes (Hardoim *et al.*, 2015). The endophytes present many intriguing possibilities, as they occupy distinctive biological spaces in plants growing in varied habitats. These endophytes produce bioactive metabolites with anti-tumor, antibiotic, antioxidant, anti-inflammatory activities (Owen & Hundley, 2004). The fungal endophytes residing in medicinal plants possess many unusual metabolites which may find their use in industry, pharmaceuticals, agriculture, and many more. The need of the hour is to focus on endophytic biodiversity, especially in medicinal plants. The interaction between the host and endophytes concerning the bioactivity of their metabolites and their interactions is one of the least studied biochemical systems. Endophytes present in medicinal plants have become relatively new hotbeds for the discovery of novel metabolites.

The fungal endophytes isolated from medicinal plants, which produce valuable bioactive phytochemicals, may produce exceptional and valuable compounds capable of modulating

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Review article

Regulation of ethylene metabolism in tomato under salinity stress involving linkages with important physiological signaling pathways

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ABSTRACT

The tomato is well-known for its anti-oxidative and anti-cancer properties, and with a wide range of health benefits is an important cash crop for human well-being. However, environmental stresses (especially abiotic) are having a deleterious effect on plant growth and productivity, including tomato. In this review, authors describe how salinity stress imposes risk consequences on growth and developmental processes of tomato through toxicity by ethylene (ET) and cyanide (HCN), and ionic, oxidative, and osmotic stresses. Recent research has clarified how salinity stress induced-ACS and - β-CAS expressions stimulate the accumulation of ET and HCN, wherein the action of salicylic acid (SA),compatible solutes (CSs), polyamines (PAs) and ET inhibitors (ETIs) regulate ET and HCN metabolism. Here we emphasize how ET, SA and PA cooperates with mitochondrial alternating oxidase (AOX), salt overly sensitive (SOS) pathways and the antioxidants (ANTOX) system to better understand the salinity stress resistance mechanism. The current literature evaluated in this paper provides an overview of salinity stress resistance mechanism involving synchronized routes of ET metabolism by SA and PAs, connecting regulated network of central physiological processes governing through the action of AOX, β-CAS, SOS and ANTOX pathways, which might be crucial for the development of tomato.

1. Introduction

Soil salinity is a hot topic worldwide and of great concern among farmers and researchers alike with special relevance to crop plants which impairs crop productivity (Sanders, 2020). Hyper osmotic stress and hyper ion toxicity are the major problems that affect the salt stressed plants (Gorham et al., 2010). Under the high salinity stress condition, roots are not able to uptake water directly from soil, resulting in the accumulation of toxic concentrations of sodium and chloride, plant nutritional disorders, and oxidative damage (Rouphael et al., 2018). The accumulated Na^+ obstructs with K^+ and Ca^{2+} uptake, which affect stomatal movement, gaseous exchange and photosynthesis. It relies on Na^+/K^+ ratio rather than the total Na^+ present in cytosol (Annunziata et al., 2017). Among horticultural crops, the tomato has great value as a fruit crop because of its anti-oxidative and anti-cancer properties, being considered as an excellent source of antioxidants and taurines, and dietary fiber, minerals, vitamins, and lycopene (Grabowska et al., 2019). Salinity stress affects the productivity of a number of dicotyledonous

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Review article

Regulation of ethylene metabolism in tomato under salinity stress involving linkages with important physiological signaling pathways

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Transcriptomics and Proteomics Studies for Biofuel Production in Microalgae: An Overview

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ABSTRACT

With increasing concerns about the global crude oil consumption, sustainable alternative fuels from renewable resources are gaining more and more attention. In the recent push of phycological research, microalgae have emerged as one of the most sustainable lipid-based biofuel feedstocks. However, their intrinsic genetic potential is usually not sufficient to enable significantly high biofuel productivity. In this regard, understanding the genes and metabolic pathways through omics studies leading to improved bio-product yield is crucial. Integrative omics analysis is a powerful biotechnology-based approach allowing abundant access to varied metabolic pathways and has facilitated understanding of the complete system of microalgae. These techniques assist us to acquire a large volume of data from a single experiment. There are several reports on the significant use of various omics techniques to upgrade the strains of microalgae for improving the microalgal biofuel production. Omics approaches that have helped in the enhancement of the cellular lipid content, are highlighted in this article. This review summarizes the current knowledge about omics studies of microalgae intending to increase the production of biofuel.

Key words: Algomics; Biofuel; Microalgae; Proteomics; Transcriptomics

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Introduction

Sustainable source of energy is a need of the present time as depleting fossil fuel supplies, escalating fuel prices, geopolitical issues and growing concern about the effects of climate change have compelled us to think about alternate sources of energy. To date, many alternative renewable energy sources, such as solar, wind, wave and tidal, have been postulated and investigated to replace fossil fuels (Brar et al., 2021). Unfortunately, none of these alternatives can compete with fossil fuels in terms of their energy efficiency, cost-effectiveness and reliability (Brar et al., 2021). However, after the discovery of 3rd generation biofuel it was thought that this could be a revolution in the field of search for alternative fuels. Biofuels, which are generated from diverse biological sources such as vegetable oil, food grains, animal fat, or lipids from yeast, bacteria, or algae, have established a niche as a substitute for fossil fuels (Hegde et al., 2015; Singh et al., 2020).

Among these sources, microalgae have been recognized as a promising biofuel alternative and a prospective third-generation feedstock for biofuel (Correa et al., 2021). The efficiency of microalgae to generate biofuel is remarkable due to their relatively high lipid content, fast growth rate, and the ability to thrive in unfavourable conditions (Li et al., 2008). It has been demonstrated that the oil yielding capacity of microalgae is 25 times greater than that of the traditional biofuel feedstock such as palm oil (Brar et al., 2021). However, because of poor biomass yield of microalgal cells cultivated in photoautotrophic mode and high harvesting costs, the application of microalgae as a source of biofuel remains in its infancy. The challenges can be resolved by using tailored microalgal strains that can effectively produce boosted biomass with enhanced levels of lipid content for efficient biofuel generation (Shahid et al., 2020). The advantages of upgraded microalgal strain can be understood by some current developments and applications. Genetic transformation and optimization of growth conditions approach have been recognized as a promising tool for enhancing the production of biomass and lipid in algal cells (Sirohi et al., 2021). Nonetheless, despite the efficiency of genetic manipulation and optimization of

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Ethno-dermatological relevance of medicinal plants from the Indian Himalayan region and its implications on cosmeceuticals: A review

Harsha Singh, Suresh Kumar, Atul Arya

Abstract

Since prehistorical times, the traditional knowledge of medicinal plants has been prevalent in India. The Indian Himalayas are one of the mega-biodiversity regions with vast reserves of medicinal plants. In dermatology, advanced healthcare solutions are not ordinarily available in rural areas; therefore, traditional medicines are used in treatment. The present review aims to emphasize and enlist the details of medicinal plants with curative action against skin disease in the Indian Himalayan region and to draw the attention of pharmacologists, botanists, and phytochemists to conduct scientific research on important ethno-dermatological medicinal plants. The review aimed to analyze the data of 112 plants from 56 families obtained from various online databases and servers. Lamiaceae and Asteraceae represent the highest number of plants against skin disorders. Leaves (44%) were the most commonly used plant part and the mode of administration of plant extract was majorly external and very few orally. The herbal formulations for skin by different cosmetic industries were studied individually to find out their key bioactive ingredients and were further listed in a table. In herbal cosmetics, *Centella asiatica* (L.) Urb. extract, sandalwood oil, and *Aloe vera* (L.) Burm. f leaf pulp are used in most herbal products because of their skin rejuvenating properties. The Indian Himalayas are the treasure box of medicinal plants but, because of increased environmental degradation, the number of plant species is declining. This review on ethno-dermatological knowledge of medicinal plants can escalate the development of drugs and new therapeutic potentials for curing skin diseases.

Keywords:

Ethno-dermatology, Indian Himalayan region, pharmacologist, phytochemist, skin disorders

Introduction

The implausible biodiversity in plant life forms in the Himalaya Centre of Plant Diversity forms a constricted band in the Himalayan Region, which is located explicitly around Himalaya's Southern border. Indian Himalayan region (IHR), which is about 300–400 km wide, 2400 km long and altitude ranging from 300 to 800 m, consists of five different biogeographical zones, namely (i) Trans Himalaya (Ladakh), (ii) Northwest Himalaya (Jammu and Kashmir, and Himachal Pradesh), (iii) West Himalaya (Kumaun and Gharwal), (iv) Central Himalaya (Sikkim and Darjeeling hills of West Bengal), and (v) East Himalaya (Arunachal Pradesh).[1] The IHR stretches across thirteen Indian states/Union territories: Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur, Nagaland, Meghalaya, Sikkim, Mizoram, Tripura, Assam, and West Bengal. The Indian Himalaya is a treasure house of medicinal and aromatic plants with approximately 70,000 known plant species.[2] The Alpine and tropical zones of the Himalayan Region have the highest

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Valorization of wastewater to recover value-added products: A comprehensive insight and perspective on different technologies

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Review

Decentralized systems for the treatment of antimicrobial compounds released from hospital aquatic wastes

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What do these dates mean?

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REVIEW

TiO_2 based photocatalysis: a valuable approach for the removal of pharmaceuticals from aquatic environment

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Abstract

Increasing population and globalization leads increase in the demand of pharmaceuticals for the existence of a healthy society. But the overuse of pharmaceutical and their continuous discharge in aquatic environment is becoming an emerging societal and scientific concern. The recalcitrant nature of these pharmaceuticals and poor removal by conventional treatment methods results in persistence of these compounds in waste bodies. Their long-term persistency causes the toxicity on non-targeted organisms present in aquatic ecosystem. Advanced oxidation processes use highly reactive and oxidising species (O_3, O_2, H_2O_2, OH·) for the removal of different organic compounds from wastewater. Among them, photocatalysis is a promising and highly efficient technique used for complete mineralization of many pharmaceutical and other organic compounds from aquatic environment without involvement of carcinogenic compounds. Primarily, heterogenous semiconductors like TiO_2 are preferred as photocatalyst in photocatalytic systems because of high thermal stability and no auto-degradation of the photocatalyst. The present review discussed on recent trends in TiO_2 based photocatalysis and its application for the removal of pharmaceutical pollutants specifically antibiotics and cytostatic compounds from wastewater so that the reuse of wastewater becomes safe as reutilization option of water and fulfil the United Nation's Sustainable Development Goals (SDG 6).

Keywords Antibiotics · Anticancer · Environmental remediation · Pharmaceutical pollutants · Photocatalyst · Surface modification

Introduction

Human beings and animals consume a lot of pharmaceutical compounds such as antibiotics, cytostatic drugs, nutritional supplements for their better survival and sustainability. Though pharmaceutical compounds are utilized for the improvement in human health, nowadays these compounds have become severe health hazards due to their persistent and non-biodegradable nature. Most of the pharmaceutical compound are not completely metabolized by organism and commonly released from body with faecal matter or urine in unmetabolized form. These un-metabolized or partially metabolized pharmaceutical compounds enter into the environment via direct discharge or in the form of municipal waste (wastewater) (Sharma et al. 2021). Besides this, untreated discharge of pharmaceutical industries, untreated medical waste (hospitals, research centres), and sewage waste also act as sources of pharmaceutical compounds in the environment (Kalia 2019) and thus the presence of these compounds are reported in sewage wastewater, surface water, tap water and ground water in varying concentrations (Klein et al. 2018).

Antibiotics are the most commonly used pharmaceuticals in human and veterinary medicine for preventing/treating microbial infections, and also as growth promoters in agriculture and aquaculture. The total amount of antibiotics used per year, including medical and veterinary uses, overcame 1 to 2 lakhs tons worldwide in 2010 (Wang and Tang 2010). This antibiotics consumption is continuously rising every

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ORIGINAL RESEARCH

Biochemical and physiological tolerance evaluation of the oil-yielding paradise tree (*Simarouba amara* Aubl.) under salt stress

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Additional information is available at the end of the article

Abstract: *Simarouba amara* Aubl., a native of tropical regions of South and Central America was introduced in India for wasteland reclamation purposes. Present study was conducted to evaluate its ability to grow under salt stress conditions. *S. amara* seedlings were exposed to different concentrations of sodium chloride (50 mM, 100 mM, 150 mM, and 200 mM). Morphologically, at higher salt concentrations (150 and 200 mM NaCl), *S. amara* seedlings showed symptoms of leaf chlorosis, wilting, and drooping. A significant reduction in leaf relative water content, photosynthetic pigments and increase in lipid peroxidation was observed under high salt stress conditions. Under salt stress, levels of both enzymatic as well as non-enzymatic antioxidants increased majorly. At 200 mM NaCl, proline and cysteine content increased by 116% and 166% respectively. Among antioxidant enzymes, maximum increase in activity was observed in glutathione reductase (320%) followed by superoxide dismutase (129%), ascorbate peroxidase (80%), guaiacol peroxidase (80%) and catalase (59%) at 200 mM NaCl. A significant increase in the activities of both enzymatic and non-enzymatic antioxidants reveals that S. amara has better defensive mechanism against salt stress, but up to 100 mM concentration. At 150 and 200 mM NaCl, salt toxicity hampered growth of the plants.

Keywords: Simarouba amara; antioxidants; lipid peroxidation; Salt stress

1. Introduction

The world population is expected to be cross 9 billion by 2050 and with such fast growing numbers, there is an extreme stress on agriculture to satisfy the demands of food, fodder, fiber, etc. (Y. Ashraf et al., 2020). Agriculture is also getting affected due to various factors such as huge reduction in cultivable lands, urbanization, unusual weather patterns, etc. Among different environmental stress that have negative impact on agriculture, enhancement of salinity in cultivable lands (soil salinity) is the most prevalent one that hampers the crop productivity majorly. Soil salinity takes place due to various natural processes like weathering, sea water deposition, etc. or due to different human activities (irrigation with brackish ground water, improper drainage system, etc.) (Evelin et al., 2019). Such salt affected lands are not fertile and are not suitable for crop production/ agriculture. Due to salt stress, different phases of plant life are affected such as seed germination, vegetative growth and reproducibility, consequently leading to reduced growth and development in plants. Toxic effects of salt stress on plants include osmotic stress and oxidative stress due to reactive oxygen species (ROS) production which further lead to osmotic and ionic imbalance, damage to functional, structural proteins, DNA, and cell membrane, reduced photosynthesis, etc. (Shrivastava, Kumar, et al., 2015); (Tanveer, Yousaf, et al., 2020). Ion toxicity (due to high Na^+ concentration) in plants affects various physiological activities which may lead to chlorosis and necrosis (Acosta-Motos et al., 2017). To mitigate the toxic effects of soil salinity, plants also have defensive mechanism which includes activation of enzymatic and non-enzymatic antioxidants, ion homeostasis, formation of com-

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UNUSUAL INFESTATION OF LITCHI FRUITS BY LAND SNAIL, *RHACHIS BENGALENSIS* (LAMARCK, 1822) IN MUZAFFARPUR (BIHAR)

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ABSTRACT : An unusual infestation of litchi fruit by the non–marine snail, *Rhachis bengalensis* (Lamarck, 1822) was the first time observed in litchi cultivating orchards in Muzaffarpur during May and June of 2019. In India, infestation and damage to vegetable and fruit crops by *Achatina fulica* (Bowdich), *Pila globose* (Swainson), *Indosuccinea semiserica* (Gould) were previously reported by many scientists. *Achatina fulica* was previously reported to cause severe damage to papaya, brinjal, beans, okra, rubber buds and guava while *P. globosa* was reported as a devastating pest of paddy and legume crops. The *R. bengalensis* was for the first time observed to infest litchi by sucking sap and feeding on the pulp of cracked litchi fruit during long periods of extremely warm weather. Results showed moderate infestation and an average of more than five snails was found per litchi plant. The damage caused by *R. bengalensis* through sucking sap and feeding pulp that led to abrasions on fruits and caused fungal contamination through their faces and slim wrinkle marks or deep slash mark on the pulp indicates the mode of infestation. In the host choice, the snails preferred cracked ripen litchi fruits more than others.

Key words : Litchi, infestation, land-snail, *Rhachis bengalensis*.

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INTRODUCTION

Molluscs have been largely neglected in the pest control literature, and yet gastropod mollusc species currently constitute some of the most significant and intractable threats to sustainable agriculture (Barker, 2002). Of more than 1500 land snails in India, seven are considered pests. By far the most serious is the introduced giant African snail, *Achatina fulica* (Bowdich) (Raut and Ghose, 1984). Veeresh *et al* (1979) reported the African giant snail, *A. fulica* as a serious pest of Ornamental crops in Bangalore, Karnataka, India. Raut and Barker (2002) reported *A. fulica* as a pest in tropical agriculture. Paul *et al* (2017) reported the extent of damage by the giant African snail, *A. fulica* to some forest and horticulture seedlings in Karnataka. Stojnic *et al* (2013) documented the damage caused by the white snail, *Cruella virgata* (Da Costa) to green onion crops. The heavy incidence of snail, *Cryptozona semirugata* (Beck) was recorded during September-October 1998 on some horticultural crops in northern Karnataka (Balikai, 1999). Palak, Brinjal, Methi, Ridge gourd, Tomato, Potato, Chillies, and Marigold were preferred by the snail, snail, *C. semirugata* while Hibiscus and Clerodendron were least preferred (Balikai, 2008).

Untypical sap-sucking and pulp-feeding infestation of Litchi fruit by large aggregation of non-marine snails, *Rhachis bengalensis* (Lamarck) were observed in Muzaffarpur in May and June of 2019 and 2020. We have repeatedly consulted various farmers about the distribution, infestation and population of *R. bengalensis*.

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ASSESSING ROAD-KILL MORTALITY IN THE HIGHWAY PASSING THROUGH URBAN, AGRICULTURAL, FOREST AND RIVER LANDSCAPES IN BIHAR

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ABSTRACT : Roads are increasing an adverse impact on road-kill and threats to the faunal diversity globally. In Bihar, very few studies have been carried out to record and assess the road-kill of faunal diversity. The present study was conducted to estimate the road kills on the National Highway in our locality. The road kills were recorded thrice a week in each habitat. The data regarding the road-kill survey was collected from Jan 2020 to Dec 2022. For the survey of road-killed animals, avians, reptiles, and other vertebrates, the national highway passing through the urban landscape, agricultural landscape, river basin, and forest land (from Gaya to Wazirganj and Rajgir wild area) was selected on the basis of availability of floral diversity and geographical location. The survey found a total of 1021 carcasses of 34 different species belonging to 4 families were recorded by road-kill on selected highways including Gaya and Rajgir from January 2020 to December 2022. The highest mortality of *Acridotheres tristis* (Linnaeus, 1760) (Common Myna) was recorded in both survey sites. While, observing the seasonal variations in road-kill, it was observed that the maximum mortality due to road-kill was found from September to January and the minimum from April to June. Management strategies and conservation practices are essential to prevent the local extinction of faunal and floral diversity due to road kills.

Key words : Road-kill, National highway, human conflict, urban landscape, agricultural landscape, river basin, forest.

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INTRODUCTION

The urban landscape has globally been a platform for regular developmental activities and human needs have led to the altering and degradation of biodiversity. However, biodiversity conservation in urban ecosystems is more important as climate change and zoonotic disease suggests that human conflict and exposure to natural phenomena in daily life is a major consideration of sentient environmental issues. The increasing demand for biological resources is due to dramatic population growth and financial development. The outcome is continuing decrease and degradation of small habitats or their alteration to other uses as per human need, the over-exploitation of natural and biological resources, loss of biodiversity, pollution, and climatic change. The human-animal conflict is the major reason behind the increase in more people crowding urban landscapes, the loss of biodiversity and habitat change extended beyond the road (Spellerberg, 1998) also caused major threats to animals and wild plants (Forman and Alexander, 1998). Along with trapping, poisoning, and illegal trade of live organisms or their body parts, road kills are also a greater reason for animal loss, and these might be examples of how urbanization is negatively impacted biodiversity.

Synthesis, Spectral Characterization on Few Transition Metal(II) Complexes Containing Novel Schiff Base Ligand Condensed from 3-Hydroxythiophene-2-carbaldehyde and Naphthalene-1,2-diamine

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Abstract

Few metal complexes of Mg(II), Zn(II), Sn(II), VO(II), ions with the Schiff base ligand 2,2'-((1E,1'E)-(1,2-naphthenylenebis(azanylylidene))bis(methanylylidene))diphenol, which as prepared by the condensation of 3-hydroxythiophene-2-carbaldehyde and naphthalene-1,2- diamine, were synthesized and characterized. The solid-state isolation was used to remove the ligands and metal complexes from the reaction mixture. The UV-Visible, FT-IR and certain physio-chemical studies validated the structural and spectral features of the ligand and complexes. Studying the IR spectra of Schiff bases has shown that the N and O atoms are ligand binding sites with the metal ion. Evidence from molar conductance measurements suggests that the complexes are not electrolytic. TLC analysis was used to check the total responses. In addition to the tetrahedral geometry predicted by magnetic susceptibility data, electronic spectra for the [ZnC20H14O2N2S2], [SnC20H14O2N2S2], [VOC20H14O2N2S], [MgC20H14O2N2S] complexes indicated a square planar geometry. In order to test for antibacterial activity, the Schiff base ligands and their complexes were exposed to a disc diffusion assay.

Keywords: Schiff base, Transition metal complex, Antibacterial activity.

INTRODUCTION

When primary amines react with carbonyl compounds, Schiff bases are formed. Schiff bases have received a great deal of attention due to their potential applications as biochemical, analytical and antibacterial reagents [1,2]. Schiff bases have been used and they can be synthesized from a wide range of carbonyl compounds and amines. Schiff base oxygen and nitrogen donor transition metal complexes have a distinct configuration, structural liability and molecular sensitivity [3,4].

Most of the Schiff bases and their transition metal(II) complexes showed antibacterial, antifungal, antitumor, anticancer, and antiinflammatory activity, which is attributed due to the azomethine moiety (-C=N-). This adds to the growing body of evidence that these compounds are an important class of molecules with important medical and pharmaceutical applications [5]. Only a few N,O donor Schiff bases and the transition metal complexes that go with them have been synthesized recently [5-8]. Keeping in mind above these facts, in the work, we have synthesized and characterized Mg(II), Zn(II), Sn(II), VO(II) metal complexes from Schiff base ligand prepared from 3-hydroxythiophene-2-carbaldehyde and naphthalene-1,2-diamine.

Experimental

All of the reagents, intermediates, and solvents were acquired commercially and utilized. The melting points were measured using a Gallen Kamp melting point instrument equipped with a hot stage. The FTIR spectra were obtained using a Shimadzu FTIR.8300 Spectrophotometer and a CsI disc, and they cover the frequency range of 4000-200 cm-1. The UV–Vis spectra in the range of 200-1100 nm were collected using a Shimadzu UV–Vis 160 A-Ultraviolet Spectrophotometer. The magnetic susceptibility was measured with a Bruke Magnet B.M.6 Magnetic Susceptibility Balance at room temperature. Atomic absorption was measured using a Shimadzu 680 ccflame, and conductivity was observed using a WTW conductivity meter. The 1H spectra were recorded in the presence of deuterated d6-DMSO as the solvent and TMS as the internal standard using a Jeol 400 MHz spectrometer. The data was analyzed using an ESI (70-eV) model and a direct intake probe attached to a Shimadzu QP-2010 mass spectrometer to display the m/z in elementary charge unit notation.

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"SAVINGS AND INVESTMENT PREFERENCES OF LOW INCOME HOUSEHOLDS"

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Abstract
The prime objective of this study is to investigate relationship between Investment decision and investment preference low income of households. We have examined the various factors such as psychological, sociological, demographical, cultural and religious factors that influence investment decisions. We used both primary and secondary sources of data collection as per the requirement of the study. Judgment sampling technique has been used to collect primary data from survey method. sample size is 56. Furthermore, descriptive statistical tools have been used to analyze primary data. The significant findings of the study suggest that there is positive relationship between Investment decision and investment preference low income of households. Investors with a high EI aptitude are competent enough to control and manage their personal financial activities in an effective and efficient manner and a vice-versa. Sample size of the study is inadequate due to time and monetary constraints. For effective data collection and data analysis only head of the family that represents entire household's responses has been recorded. Future study can explore individual family member's contribution towards personal finance.

KEY WORDS: Investment decisions, Investment preference, financial literacy, Head of households, financial strategy etc.

INTRODUCTION

Indian financial system is so giant and divergent in nature that is scattered in several aspects whether organized or unorganized. Each sect of it plays a significant role in economic growth and development. The term Investment can be simply defined as putting your money outside your pocket to gain some commensurate return in future. In this study we tried to explore low income households savings and investment preferences and their attitude towards formal or informal financial market. Investment has become necessity for everyone whether households that do investment basically to satisfy their consumption needs or business houses that do investment primarily to fulfill their productive need (Selvakumar and Mahesh, 2015). It has been observed that still families in India give importance to conventional values that they are carrying forward from their ancestor where family are build on mutual sacrifice to strengthen the relationship between family members. Where still head of the family take financial or non financial decisions in order to attained financial well being of entire family. We also felt at the same time that families are now turning back to their traditional custom and culture as it was

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ROSCAs: INFORMAL PERSONAL FINANCE OF LOW INCOME HOUSEHOLDS

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ABSTRACT

Presents study primarily focuses to know that how in absence of adequate or suitable formal financial instruments a low income family or investor satisfy their financial requirements? Emotional intelligence of a person related to investment decision of investors or not? Major objective of this study is to investigate the role of emotional aspects in personal financial decisions of low income households/family. The study is confined to Delhi region only due to several constraints such as time and money. Total sample size for the study is 56, we used purposive sampling technique to collect primary data using structured questionnaire. Key findings of the study suggest that there is significant positive association between emotional factor and personal financial decisions of low income households. Households having sound emotional quotient are capable to manage their financial matter smoothly and a vice a versa. Small sample size and narrow geographical area etc. are the key limitations of the present study. There is a huge opportunity to explore this area of research in future also. It has been observed that formal financial setups are inadequately available in the organized financial market for low income households. So they are bound to depend directly or indirectly on informal sources of personal finance, for example Chit fund or Kametis, Nidhis and other unorganized NBFC instruments.

KEY WORDS: Emotional Intelligence, Personal Finance, Low Income Households, Financial System, Financial Environment etc.

INTRODUCTION

Indian financial system is broadly divided into two categories organized and unorganized financial system. Hence, it is important for the development of better financial system, because financial system and economic growth are interlinked to each other (Rao, 2007). India, being one of the fastest growing economies rather top five major economies of the world is on the path of advancement to incorporate favorable amendments that suits to the current financial system (Kirton, 1996). Due to policy failure of formal financial setups informal or unorganized financial structure coexists.

Informal financial sector is characterized as unregulated and non institutionalized dealing with the conventional and rural touch of unorganized sector of economy (Rao, 2007). The reason for its presence in the modern society because of financial dualism, socio- economic disparities, cultural structure and financial repression which prohibits or keep away certain section of the societies or deprived or underprivileged group of people from the access to formal financial system, particularly in the situation of borrowings or credits from the formal financial institutions such as formal banks.

Yemapoetics: Towards a Theory of Healing in Indigenous Poetry from Sikkim

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Abstract
Literature that is being composed from or about the politico-geographical category of Northeast India focuses on violence and ethnic movements in major ways (Hazarika, 1996; Barpujari, 1998; Baruah, 2005; Paula, 2008). While Weberian understanding of indigenous cosmology has led to archiving, documenting and research on ethnic epistemologies from Northeast India, in the absence of indigenous literary theories, literature from this region faces the challenges of homogenisation or becoming case studies for ethnographic documentation and anthropological inquiry (Karlsson & Subba, 2006; Subba, 2009; Lepcha et al, 2020 in the context of Sikkim). This paper intends to propose a theory of reading that upholds the role and participation of the poet(ess) as a shaman- a transforming agent and a transformed individual herself. This theory is being named Yemapoetics, deriving its epistemic framework from the figure of shamaness or Yema in the Limboo healing tradition in Sikkim. Yemapoetics is an attempt to propose a new indigenous paradigm for indigenous literary expression around the world. This theory identifies stages of poetic composition as well as reception, ranging from purification, possession, and communication to catharsis. An indigenous literary theory like this will provide contexts for locating the poet(ess), examining her/his role as a community healer who connects the modern, urban psyche of individuals with communal, archetypal symbols. This enables a process of retracing and remembering through the poetic act that is essential to healing and recovery. Just as Limboo cosmology recognises women as first humans to be created, this paper argues that women's psychospiritual agency should be at the centre of poetic theories to accord validity and applicability of feminist spirituality to indigenous literary theorisation. For this purpose, an illustration of the proposed theory will be made with reference to select indigenous poets from Sikkim.

Keywords: Limboo-Literary Theory-Feminist Spirituality- Northeast-Sikkim.

Introduction

In northeast India, the topographical contours are intrinsically linked to similar yet distinctive epistemologies that shape the ethnic diversity and indigenous identities of the inhabitants. The eight states that are identified as belonging to the political category of Northeast India possess a range of indigenous worldviews that are distinctive in symbolism and rituals yet connected by shared cosmological structures and ceremonial significations. In *Northeast India: A Place of Relations* (2017), Saikia and Baishya (Eds.) argue for continuities, intersectionalities and solidarities in the political, cultural and lived traditions in the geopolitical category of Northeast India. In *Oral*

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Urbanisation in *The White Tiger*: Mapping the transformation of the being

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Abstract
This study critically examines Aravind Adiga's novel, *The White Tiger*, with a specific focus on its portrayal of power dynamics and social mobility in contemporary Indian society. Drawing on urban and sociological theories, this study analyses the protagonist's evolution from servitude to entrepreneurship as a lens to explore themes of class, corruption, and exploitation. Urbanisation has been a driving force behind social mobility in Delhi; the migration of people to the cities exposes them to new opportunities and experiences that were previously unavailable to them. Their exposure to the urban space has contributed to their advancement in education, individual entrepreneurship and financial security resulting in their social mobility, however, this process has not been without its challenges. By delving into the complexities of power relationships, this paper aims to shed light on the underlying social and economic structures that shape the protagonist's being and the larger narrative.

Keywords: urbanisation, social mobility, power, migration, class struggle

Introduction

Civilization has thrived in its cities since time immemorial, with each generation observing transformations inside the cities, changing their nature from ancient times to modern. Over a period of time, modern cities have prospered and altered the initial nature of the cities, especially in demographic and spatial terms. The city of Delhi has also undergone a facelift with the changes in economic policy leading to privatisation of Public Sector Undertakings (PSUs), withdrawal of subsidies, and tax benefits for corporate enterprises have altered the spatial and financial landscape of the capital. Furthermore, expansion of National Capital Region, investments in projects like metro and rapid transit systems, and construction of high-rise buildings to provide accomodation to the ever-expanding population has significantly resulted in rapid urbanization.

Delhi has been historically renowned for its illustrious past and its magnificent legacy where atleast seven cities have risen and fallen on account of varied reasons over the years. Its past splendor prompted the British to appropriate this historical space to develop its seat of power. This idea is reiterated in R.E. Frykenberg's *The Study of Delhi*, where he mentions that the capital

has served as the centre of political power despite intermittent interruptions for centuries. Thus… a ruler came to power in India, no ruler could be *seen* as Ruler of India unless and until his citadel was indeed fixed at Delhi (5).

In literature, the capital has been courted as 'beloved' by rulers while the splendor of its past has never been neglected since its reputation as the city that had been the capital of empires; Indraprastha, Lal Kot, Siri, Ferozabad, Tughlaqabad, Shahjanabad, and New Delhi, supersedes it.

The various rulers of the region made great efforts to create a lasting impression by constructing massive forts, fortified frontiers, beautiful gardens and, strong citadels. The structures that stood as the emblem of ambition in different citadels, now lay in varying states of ruin and disrepair, charting the decline of empires over the years. Since 1931, initially under the British and later under independent India since 1947, Delhi has served as the seat of Government for India. Let's keep in mind that the physical infrastructure that was constructed, by Lutyen and Baker, to demonstrate the grandeur of the British Empire, was subsequently made to the represent democratic institutions by the Government of free India.

Delhi has historically served as a major political hub and has also emerged as a significant cultural and intellectual centre while being home to India's leading Universities that continue to attract greater inflow of young migrants. The change in the urban scape was coupled with the fact that Delhi has emerged as a major commercial centre in Northern India in the post liberalisation period resulting in the outpouring of population in the ever-expanding National Capital Region. This inflow was largely credited to the economic liberalization that catapulted Delhi into an altered economic sphere, which signaled a new stage in the development and perception of the city after the 1990s.

Consequently, the capital is home to people of different regions, races, classes, cultures, and languages co-existing harmoniously. Wirth mentions that the city has "historically been the melting-pot of races, people and customs, and a most favorable breeding ground of new biological and cultural hybrids" and has celebrated the individual differences visualised in the city (66). Therefore drawing the conclusion that the development of cities is one of the most opulent factors of the modern era, which is assisted by the mobility of people to urban centres following their urbanisations.

In *The White Tiger*, the narrator utilises ominous humour to tell the tale of his journey from poverty to affluence, with urbanisation and capitalism playing a significant role. Adiga is able to examine the issues that exist in an urban setting via the narrative of Balram, the narrator. It helps to have an expanded perspective of Delhi by presenting contrasts within the urban agglomeration's concrete jungle and malls and the impoverished slum dwellings, Old Delhi and New Delhi, the economically successful and the socially and economically disadvantaged, the differences in the

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Profile of atmospheric particulate PAHs near busy roadway in tropical megacity, India

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Abstract

Objective: This study focuses on the profile of ambient particulate polycyclic aromatic hydrocarbons (PAHs), their seasonal distribution, source identification and human health risk assessment due to inhalation exposure of ambient PAHs in Delhi, India.**Materials and Methods:** Two sampling sites were chosen, one at roadway (MH) and other at urban background (JNU) site in Delhi. Determination of PAHs was carried with the help of HPLC with UV detector. Principal component analysis and Molecular diagnostic ratios were used for the source apportionment of PAHs. Health risks associated with inhalation of particulate PAHs were assessed using benzo(a)pyrene equivalent concentration and incremental lifetime cancer risk (ILCR) approach.**Results:** The results showed that the average mass concentration of Σ_{16} PAHs near roadway (67.8 ± 40.2 ng m^{-3}) is significantly higher than urban background site (56 ± 30 ng m^{-3}). Moreover, source apportionment study indicated that major PAH-emission sources in Delhi NCR are traffic and coal combustion. ILCR values at both the sites fall in the range of 10^{-2}-10^{-4} that corresponds to the priority risk level (10^{-3}) and higher than the acceptable risk level (10^{-6}).**conclusions:** The high PAHs concentration at MH site was due to it's nearness to busy traffic area. Thus, the spatial variations in PAHs were influenced by local emission sources. The high PAHs level during the winter season can be due to their higher emissions from local heating sources, shift of gas/particle partitioning toward the particulate phase at low temperature and reduced photochemical degradation of some PAHs in winter. The low level of PAHs in monsoon season can be attributed to their wet scavenging and higher percentage in vapor phase. PCA showed that the emissions from vehicles predominate at MH site; whereas, coal combustion and traffic both are the significant PAHs sources at JNU site. Health risk assessment revealed that the highest exposure risks occur at busy traffic site, thereby indicating a significantly higher health risk to the population of Delhi.

Keywords: Delhi; PAHs; health risk; sources; traffic site.

Related information

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ORIGINAL PAPER

Cultivable microbial diversity in speleothems using MALDI-TOF spectrometry and DNA sequencing from Krem Soitan, Krem Lawbah, Krem Mawpun, Khasi Hills, Meghalaya, India

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Abstract

The microbial diversity in the Indian caves is inadequately characterized. This study reports on the culturable microbial communities in caves from the Indian sub-continent. This study aims to expand the current understanding of bacterial diversity in the speleothems and wall deposits from Krem Soitan, Krem Lawbah, Krem Mawpun in Khasi Hills, Meghalaya, India. A culture-dependent approach was employed for elucidating the community structure in the caves using MALDI-TOF spectrometry and 16S rRNA gene sequencing. A high bacterial diversity and a greater bacterial taxonomic diversity is reported using MALDI-TOF spectrometry and 16S rRNA gene sequencing. High microbial enumerations were observed on dilute nutrient agar (5.3×10^3 to 8.8×10^5) followed by M9 minimal medium (4×10^4 to 1.7×10^5) and R2A medium (1.0×10^4 to 5.7×10^5). A total of 826 bacterial isolates were selected and preserved for the study. 295 bacterial isolates were identified using MALDI-TOF spectrometry and the isolates which showed no reliable peaks were further identified by 16S rRNA gene sequencing. A total 91% of the bacterial diversity was dominated by Proteobacteria (61%) and Actinobacteria (30%). In addition, bacterial phyla include Firmicutes (7.45%), Deinococcus-Thermus (0.33%) and Bacteroidetes (0.67%) were found in the samples. At the genus level, *Pseudomonas* (55%) and *Arthrobacter* (23%) were ubiquitous followed by *Acinetobacter, Bacillus, Brevundimonas, Deinococcus, Flavobacterium, Paenibacillus, Pseudarthrobacter*. Multivariate statistical analysis indicated that the bacterial genera formed separate clusters depending on the geochemical constituents in the spring waters suitable for their growth and metabolism. To the best of our knowledge, there are no previous geomicrobiological investigations in these caves and this study is a pioneering culture dependent study of the microbial community with many cultured isolates.

Keywords Cave · Microbial diversity · Geomicrobiology

Introduction

Caves are geo-biologically interesting ecosystems and are usually characterized by speleothems, slimy wall deposits and biofilms that are known to host diverse microbial communities. These habitats are considered as extreme environments. Most microbial communities in caves rely on oligotrophic or chemotrophic modes of nutrition (Barton et al. 2007). These unique habitats need to be explored for microbial diversity studies as they are sites for the identification of novel microbes, which can have potential applications such as in the production of antibiotics, in bioremediation of contaminated sites, understanding microbe-mineral interactions and in the search for life on other planets (Boston et al. 2001). For example, *Actinobacteria*, identified from

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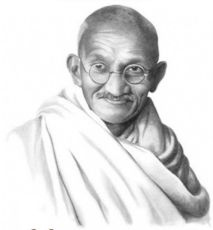

Some men changed their times...
One man changed the World for all times!

Comprehensive Website on the life and works of

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Understanding Individuality in Gandhi's Moral Philosophy

- By Kumar Rahul* and Sanjeev Kumar#

Abstract

This paper traces the notion of individuality in Gandhi's moral philosophy and argues that his notion of individuality is tied with a 'supreme principle of morality'. Swaraj is the epistemic venue from where spring up impulses of individuality. Further, this paper argues that the quest for self-knowledge and autonomy moralises Candhi's individuality by guarding it against atomism and possessive individualism. By situating the self in an interrelated cosmos, Gandhi radicalises the notion of individuality.

Individuality has a philosophical pedigree. John Locke's 'An Essay Concerning Human Understanding' is one of the pioneering works on individuality. Before Locke, the idea of individuality had made a beginning in 'Confessions' of St. Augustine, and it travelled to Locke through Michel de Montaigne. Liberalism defines individuality in distinctly unique ways.[1] It is founded in the principle of equality of civil liberties, perceived in terms of 'non-interference' and 'right to privacy'. 'Individual' alone is the unit-recipient of civil liberties, which allow them to have, preserve and celebrate 'difference' and 'uniqueness', Individuality is held as the most precious possession of all humans, hence inviolable. The career of 'Individuality' has remained tied to 'individual liberty' for a long time until Kant formulated it in terms of autonomy: the ability to be a law to oneself, to direct one's life based on guidance derived from within.[2] In fact, the quest for self-knowledge is to facilitate the individual to explore her individuality.

Why locate individuality in Gandhi's moral philosophy? In his seminal treatise, Hind Swaraj, Gandhi seems to have a moral project at hand: to set out the 'supreme principle of morality'[3], a yardstick for each individual to ordain her civic, social and political life. Gandhi's swaraj, as he postulates it, is not to be a readymade tool for accessing freedom. It is rather to be a climate of freedom. Hence, in Gandhi's philosophy, individuality is not as simplistic and atomistic as in liberalism. Swaraj as 'self-rule' lays out a self-other relationality framework. It is a 'disciplined rule from within'[4], the rule of the self over itself. It is "a sacred word, a Vedic word, meaning self-rule and self-restraint, and not freedom from all restraints[5]...." His expositions of swaraj in his writings radiate impulses of individuality. They provide a moral motivation to fathom how he understood individuality and to inquire if his notions of individuality are at variance with liberalism. Notwithstanding temptations to see him as a reformed liberal, this paper argues that his notion of individuality strikes a harmony between the self and the other rather than seeing them in adversarial or atomistic terms. Further, understanding Gandhi's individuality entails a cosmic framework. We maintain that applying a Western-liberal framework to fathom Gandhi's notion of individuality is an anachronistic and methodological mismatch.

COVID-19 Pandemic and India's Regional Soft Power Diplomacy

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Today soft power is increasingly being recognised as an important foreign policy instrument. Over the years India has also been trying to project its soft power to improve its image among the comity of nations. India's recent help to the regional neighbours during the COVID-19 pandemic confirms and reinforces this trend towards soft power diplomacy. Such a gesture of India has been widely applauded and has helped to generate goodwill for India within the neighbours. The paper intends to explore the conceptual framework of soft power diplomacy focusing mainly on the recent interventions of India's neighbourhood policy and soft power diplomacy in the period ensuing the pandemic.

Keywords: Soft Power. Foreign Policy, diplomacy, covid, regional cooperation

During the present COVID-19 pandemic, India has been forthcoming in extending aid and assistance to the neighbouring nations to help them tide over the crisis. Such an act of generosity is widely seen as India's exercise in soft power diplomacy to move closer towards its neighbours. Despite the logic of historical, geographical and cultural proximity, there exists a significant gulf between India and the neighbouring countries. India is generally seen as hegemonic and intrusive power in the region- an image largely attributed to India's reliance on hard power resources based on military and economic muscle to shape its relation with the neighbours (Burgess, 2009). However, since the end of the cold war, in response to the changing dynamics of regional and global politics, India has brought significant modification in its approach towards the neighbours and has come to emphasise more on non-reciprocity and accommodation while dealing with them. Concomitant to this new policy framework, there has been a visible shift in India's approach towards leveraging its soft power resources as a means to forge closer ties with the neighbours based on mutual trust and respect. The economic aid and assistance and humanitarian relief that India extended towards the neighbours during the time of crisis can be cited as instances of such soft power diplomacy of India.

While successive regimes in India since 1990s have tried to make use of soft power resources to attract its neighbours, such reliance on soft power to bolster its image both within and beyond the region has assumed new prominence during the current Modi regime. The economic and humanitarian aid programme that India has undertaken to offer relief to its neighbours during their time of crisis in recent time clearly reflects Modi Government 'neighbourhood first' principle. The medical and economic aid that India has extended to its neighbours during the COVID-19 pandemic can be seen as a continuation of India's new soft power diplomacy. India's role in the pandemic as the supplier of medicine, other medical equipment and much needed vaccines has earned it the reputation of a responsible world power and has been acknowledged both within and beyond the region. However, during the second wave of the pandemic, as India struggled to deal with the crisis and with India's decision to suspend its vaccine supply, India's soft power diplomacy suffered a huge setback. Against this background, the present paper underlines a conceptual framework to analyse the idea of 'soft power'. It highlights India's soft power diplomacy vis-à-vis its neighbours and deliberates on how India has sought to project its soft power in the neighbourhood during the COVID-19 pandemic and finally assesses the impact of such soft power diplomacy for India.

Soft Power: A Conceptual Framework

American scholar Joseph S Nye first introduced the term soft power in an article published in Foreign Policy in 1990. He noted: 'Today .....the definition of power is losing its emphasis on military force……The factors of technology, education and economic growth are becoming more significant in international power' (Nye, 1990, p. 154). He adopted a behavioural definition of power and defined it as the ability to attract others to get the outcomes one wants (Nye, 2021, p. 197). According to him, there

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Effects of Gender and Type of Institutions on Teacher's Self-Efficacy and Job Satisfaction among Mizo Secondary School Teachers

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It is considered important for teachers to be contented and satisfied with their job as they play crucial roles in facilitating learners and students. Moreover, a teacher's belief on his/her competence determines the quality of education s/he create for students. Keeping these in mind, the present study explored the phenomenon of Job Satisfaction and Self-Efficacy among teachers. Gender comparison and the effect of Type of Institution/Schools on Teacher's Job Satisfaction and Teacher's Self- Efficacy were examined. Participants included 705 Secondary School Teachers from all districts in Mizoram (21) who were selected using purposive sampling from Mizoram situated in the North-East of India. Teacher Job Satisfaction Scale by Munir & Khatoon (2014) and Teacher Sense of Efficacy Scale – Short Form developed by Tschannen-Moran & and Woolfolk Hoy (2001) were used as psychological tools. Results revealed that Mizo Secondary School Teachers were generally high on Job Satisfaction (M= 3.98, SD= .44) Self-efficacy (M= 7.09, SD= 1.18) and Efficacy in Student Management (M= 7.3, SD= 1.15) . Gender effect on Job Satisfaction was significant t(1)= 16.46, p= .00 but not on Self-Efficacy t(1)= .002, p= .96 . No significant effect of type of institutions on Job Satisfaction t(1)= .05, p= .82 and Self-Efficacy t(1)= 1.13, p= .29 was found. Importance of teachers' contentment and self-confidence, implications for future supportive researches in similar areas were discussed.

Keywords: job satisfaction, teacher's self-efficacy, gender, private-public school teachers

Among variants of factors that may determine the effectiveness of school teachers, teacher's job satisfaction and self-efficacy are distinctively relevant. A teacher's dedication, work motivation and interest in teaching are sustained by their level of job satisfaction (Munir & Khatoon, Classroom management, level of involvement with students, visions and goals executed through sincere arrangement and teaching designs also contribute to teacher's belief in their efficacy (Allinder, 1994). The quality of teachers with high self-efficacy will include- excitement for

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Emerging Plant Growth Regulators in Agriculture

Roles in Stress Tolerance

2022, Pages 215-244

Chapter 8 - Nitric oxide and hydrogen sulfide interactions in plants under adverse environmental conditions

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Abstract

The inherent defense system of plants ascertains their survival under any adverse environmental condition. However, perception of stress stimulus and accurate response

Adaptation of Microalgae to Temperature and Light Stress

Sarita Kumari, Srota Satapathy, Mrittika Datta, and Savindra Kumar

Abstract

Microalgae, the photosynthetic autotrophs, are considered an important base of the food web. Furthermore, microalgae also have the potential to be a great candidate for sustainable sources of energy, soil conditioner, bioactive compounds and other economically important products as well as an alternative mode of agriculture. It is a well-known fact that the survival, growth and productivity of any organism including microalgae are strongly affected not only by their physiological and biochemical processes but also by biotic and abiotic factors in the environment. In the present scenario when global climate change which is one of the most important issues worldwide may also have a great impact on microalgal growth. Although there are many more but increased temperature and elevated light intensity (including ultraviolet radiations) are the two main repercussions of global climate change. Given that growth is balanced under a specific set of environmental conditions, therefore many microalgae can adapt to these two major stresses or extreme conditions. Interestingly by virtue of nature, we humans are blessed by such adaptation of microalgae which presents a source of a sustainable source of energy, valuable products and alternative modes of agriculture. In the present scenario where we are facing extreme climate changes, global warming and ozone depletion, understanding this adaptive behaviour of microalgae will be very useful so that we are future-ready to face such extreme stress conditions.

Keywords

Adaptation • Biofuel • Light-stress • Microalgae • Psycrophiles • Temperature-stress • Xanthophyll cycle

Abbreviations

ATP	Adenosine Triphosphate
Chl a	Chlorophyll A
Chl b	Chlorophyll B
Car	Carotenoid
DHA	Docosahexaenoic Acid
DNA	Deoxyribonucleic Acid
EPA	Eicosapentaenoic Acid
EPS	Extracellular Polymeric Substances
FA	Fatty Acids
HSP	Heat Shock Proteins
IBPs	Ice Binding Proteins
IPCC	Intergovernmental Panel on Climate Change
LHCx	Light harvesting complex protein
MAAs	Mycosporine-like Amino Acids
MUFA	Monounsaturated Fatty Acids
NPQ	Non-photochemical Quenching
PAR	Photosynthetically Active Radiation
PSI	Photosystem I
PSII	Photosystem II
PUFA	Polyunsaturated Fatty Acids
Q_{10}	Arrhenius Functions/ Temperature Coefficient
RNA	RiboNucleic Acid
ROS	Reactive Oxygen Species
RUBISCO	Ribulose-1,5-bisphosphate carboxylase/oxygenase
RuDP carboxylase	Ribulose 1,5-Diphosphate Carboxylase
UV	Ultraviolet

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Green Sustainable Process for Chemical and Environmental Engineering and Science

Green Solvents and Extraction Technology

2023, Pages 17-50

Chapter 2 - Chemistry of ionic liquids in multicomponent reactions

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Abstract

Room temperature ionic liquids are emerged as versatile catalyst and green solvents for various organic transformation with several advantages compared with conventional catalyst and reaction medium. The additional advantages of room temperature ionic liquids such as density, solubility, refractive index, and viscosity can be fine-tuned as per requirement by changing either cation and anion or both. Multicomponent reactions are exceptionally useful methodology for easy and rapid synthesis of structurally diverse

Introduction to Airborne Particulate Matter: Source, Chemistry and Health

1

Saurabh Sonwani and Anuradha Shukla

Abstract

The problem of airborne particulate matter is rising since past few decades, and now it has been a major cause of concern for air quality, climate and environmental health, especially for the developing nations. Characteristics of the particulate matter depend on their source of origin, morphology and composition. Variety of airborne particulate participates in the atmospheric chemistry and physics and impacts on human health after their exposure. The present chapter provides a brief outline of the airborne particulate matter with respect to their source, chemistry and health impacts on human health. It also mentioned the important source apportionment analysis used for possible source identification. Secondary aerosol formation through gas-to-particle conversion and atmospheric deposition process (dry and wet deposition) for the removal of particulate matter was also discussed in detail. The adverse effect of increasing level of ambient particulate matter through various exposure pathways (inhalation, ingestion and dermal) was also mentioned. Such expose can cause cardiopulmonary and lung cancer-related issues and is responsible for the increase in the rate of mortality. Thus, it was suggested that by following the ambient air quality standards, the average life expectancy can be improved across the world.

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Keywords

Particulate matter · Emission source · Atmospheric process · Human health

1.1 Introduction

Airborne particulate matters, consisting of solid or liquid particles suspended into the atmosphere, may be a complex mixture of organic chemicals, metals, and soil or dust particles. Such particulates range in size from few tens of Ångstroms to several hundred micrometres. Particulate matters (PMs) are classified on the basis of their size range, source of origin, chemical composition and effects. PMs are originated from variety of natural (dust, sea salt, forest fire and volcanic eruption) and anthropogenic sources (traffic, coal combustion, industries and biomass burning). It can be categorized into primary (directly release from their sources) and secondary pollutants (form through atmospheric chemical transformation reaction) on the basis of their origin. Source apportionment studies are performed to identify the possible source of the particulate matters in the atmosphere. The finer particles comprise the secondary aerosol, combustion particles, and recondensed metallic and organic vapours. Finer particles also contain carbonaceous fraction of fine particles that consist of elemental carbon (produced by incomplete combustion) and organic carbon (produced by combustion exhaust and secondary organic compounds formed by photochemistry). These constituents are the most abundant in fine particles after sulphates. Additionally, sulphates and nitrate are designated as the most abundant chemical species along with coarser PM. However, the most common combination of the coarser particles consists of oxides of silicon, aluminium, calcium and iron. The size of airborne particulate matter differs over different orders of magnitude (Fig. 1.1). Coarser PM, less than 10 μm or less in diameter, is considered as PM_{10}, whereas finer particles (PM less or equal to 2.5 μm in diameter) are considered as $PM_{2.5}$.

The coarse mode particles are mechanically produced by the break-up of larger solid particles. These particles can be originated from resuspension of soil dust during agricultural processes, uncovered land or mining operations. Seal salt spray, pollen grain and resuspension of road dust are also considered as coarse mode particles. Fine mode particles are largely produced from gases. The particle less than 0.1 μm is formed by the condensation of low vapour pressure substances or by atmospheric chemical reactions. Gas or vapour molecule is attached on the particle surfaces resulting in increase in the particle size, known as condensation, and it is the most common process in the finer particles, whereas the coagulation is the most efficient for large numbers of particles.

Apart from size and shape of the particle, the chemistry of the PM is very much dependent on its chemical composition. Inorganic ions and organic compounds constitute a major fraction of the particulate matter, while elemental carbon (EC) also known as black carbon (BC) contributes to a lesser fraction (Krivacsy et al. 2001). The concentration of different inorganic ions has been reported by several studies across the world, whereas the data for carbonaceous components are

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Plants and Their Interaction to Environmental Pollution

Damage Detection, Adaptation, Tolerance, Physiological and Molecular Responses

2023, Pages 109-123

Chapter 6 - Fly ash toxicity, concerned issues and possible impacts on plant health and production

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What do these dates mean?

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Abstract

Fly ash is considered as toxic waste and creates nuisance to the environment. It consists of hazardous metal substances like aluminum, lead, cadmium, mercury, etc. which hinder the growth of crops or plants growing in the vicinity of fly ash deposition area. Due to the presence of toxic metals and oxides in fly ash, the quality of soil also gets

Nature of Sand and Dust Storm in South Asian Region: Extremities and Environmental Impacts

6

Sanjoy Maji and Saurabh Sonwani

Abstract

Sand and dust storms (SDS) are very important atmospheric extreme events that occurred under the influence of turbulent winds with dust particles in any arid region. These are the lower atmospheric meteorological events and their environmental implications are being recognized in recent years due to their growing significance with the climate, human health, and socio-economy. The SDS involves a reduction of visibility to less than 1000 m. The identification of SDS events and their frequency is important to assess their role as climatological and geomorphological agents. The SDS events pose a challenge to the goals of sustainable development. Generally, SDS is a common atmospheric phenomenon in arid, semi-arid, and dry sub-humid areas, though it can travel thousands of kilometers across the countries and oceans, and depends on the wind speed and particle size distribution. Sometimes, SDS accumulate other pollutants on their way and transport them from one place. On the routes of transportation SDS also affects the regional biogeochemical cycle. SDS have a several beneficial and adverse impact on the environment. The primary impacts of SDS events include atmospheric radiation balance, regional precipitation, and hurricane activity. The SDS events are also responsible for elevated levels of fine particulates in the atmosphere that are associated with premature mortality and cardiovascular problems, respiratory problems, lung carcinoma, and severe respiratory tract infections. Such inhaled fine particle is not only composed of fine mineral

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Particulate Matter Regulatory Policies: National and Global Approach

12

Vandana Maurya and Saurabh Sonwani

Abstract

Decreasing air quality has posed a great threat to humans health and environment. The rising concentration of particulate matter (PM) in the ambient air has made the condition even worse. PM includes smoke, fumes, soot, and other combustion by-products, and also natural particles such as wind-blown dust, sea salt, pollen, and spores. Rapid increase in the concentration of PM has been observed from different sectors, i.e., transport sector, household sector, and industrial sector. Various sectors have been dealt in different chapters of this book. In this chapter, various regulatory policies about particulate matter have been dealt in transportation sector. Various regulations, i.e., improved vehicle engines, fuel regulation, alternative fuels, traffic management activities, operating restriction and pricing, lane and speed management, traffic flow control, odd–even strategy, vehicle sharing systems, improved transit systems, and lane and speed management, are followed around the world. Standards play a crucial role in regulatory mechanism and need to be encouraged to reduce science–policy gap.

Keywords

Standards · Particulate matter · Air pollution · Source apportionment · Air quality

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Airborne Particulate Matter

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Introduction to Airborne Particulate Matter: Source, Chemistry and Health

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Saurabh Sonwani and Anuradha Shukla

Abstract

The problem of airborne particulate matter is rising since past few decades, and now it has been a major cause of concern for air quality, climate and environmental health, especially for the developing nations. Characteristics of the particulate matter depend on their source of origin, morphology and composition. Variety of airborne particulate participates in the atmospheric chemistry and physics and impacts on human health after their exposure. The present chapter provides a brief outline of the airborne particulate matter with respect to their source, chemistry and health impacts on human health. It also mentioned the important source apportionment analysis used for possible source identification. Secondary aerosol formation through gas-to-particle conversion and atmospheric deposition process (dry and wet deposition) for the removal of particulate matter was also discussed in detail. The adverse effect of increasing level of ambient particulate matter through various exposure pathways (inhalation, ingestion and dermal) was also mentioned. Such expose can cause cardiopulmonary and lung cancer-related issues and is responsible for the increase in the rate of mortality. Thus, it was suggested that by following the ambient air quality standards, the average life expectancy can be improved across the world.

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Particulate Matter Regulatory Policies: National and Global Approach

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Abstract

Decreasing air quality has posed a great threat to humans health and environment. The rising concentration of particulate matter (PM) in the ambient air has made the condition even worse. PM includes smoke, fumes, soot, and other combustion by-products, and also natural particles such as wind-blown dust, sea salt, pollen, and spores. Rapid increase in the concentration of PM has been observed from different sectors, i.e., transport sector, household sector, and industrial sector. Various sectors have been dealt in different chapters of this book. In this chapter, various regulatory policies about particulate matter have been dealt in transportation sector. Various regulations, i.e., improved vehicle engines, fuel regulation, alternative fuels, traffic management activities, operating restriction and pricing, lane and speed management, traffic flow control, odd–even strategy, vehicle sharing systems, improved transit systems, and lane and speed management, are followed around the world. Standards play a crucial role in regulatory mechanism and need to be encouraged to reduce science–policy gap.

Keywords

Standards · Particulate matter · Air pollution · Source apportionment · Air quality

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Chapter 10
Energy Levels, Transition Data and SXRay Spectral Lines in W LXVII

Rinku Sharma and Arun Goyal

Abstract A main ingredient for understanding the influence of Tungsten 'W' as a plasma impurity and its impact on the plasma in experimental investigation is primarily done with the help of the spatially resolved theoretical spectroscopic diagnosis of W ions. In this research article, We have performed calculations for the excitation energies (Ex Ene), wavelength (Tr Wav) and line strengths (LSt) of emitted photon during the transition from upper level to lower level transitions rates and other transition parameters for first fine structure 80 levels of W LXVII by employing fully relativistic Multi-Configuration Dirac-Fock (FR-MCDF) technique. The strong interference effect of Quantum Electrodynamics corrections (QEDC) and Relativistic Breit interaction term (RBIT) in the calculations for energies of levels is observed. Our results, where possible, have been compared with the few previous theoretical calculations, NIST and experimental available results of Ex Ene that are available. The 31 electric dipole (E1) transitions from ground state are Soft X-ray transitions (SXRay) have been computed. In addition, the accurate and new atomic and radiative data of O-like W not available in the research articles is furnished. This dataset which is not published upto the knowledge of the authors can be useful in the field of biophysics, cell biology and astrophysical plasma.

10.1 Introduction

Tungsten (W) has been identified as a main candidate in the fusion research for the plasma facing materials (PFMs) of ITER and succeeding fusion reactor. The focus of experimental study is on the strong radiation emissions of highly ionised W- ions (about W20+ to W50+) in the vacuum Ultraviolet (VUV) to the soft x-ray (SXRay) region in electromagnetic spectra enveloping the thermal range of electrons from about 0.5–5.0 keV.

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Chapter 46
Energy Levels and Oscillator Strengths of Sulphur Like Cr Useful in Astrophysical Plasma

Falta Yadav, Prafulla Chandra Bhowmick, and Narendra Singh

Abstract Energy levels and oscillator strength are reported for the lowest 188 fine-structure levels of sulphur like Cr ion. In this paper, we have used Configuration Interaction method through CIV3. The relativistic effects are included using Breit-Pauli approximation by adding mass-correction, Darwin, Spin-orbit terms to the non-relativistic Hamiltonian. For electric dipole allowed transitions, we have also modified the diagonal elements of hamiltonian matrix before the calculations of the oscillator strengths. Our calculated energies are very close agreement with the NIST data. Exact identification of most of the levels become very difficult due to strong mixing between several fine structure levels. We estimated new oscillator strength and energy levels data where no other experimental and theoretical results are available.

46.1 Introduction

Chromium element is very essential for studies of Astrophysical plasma, as many of the lines are frequently observed from various ionization stages. So these lines are very helpful in understanding Astrophysical plasmas like density, temperature and chemical composition. The sulphur like isoelectronic sequence has been the subject of attention due to its application in Astrophysical plasmas. Several authors have been carried out Relativistic calculations for energy levels of Sulphur like ions [1–4]. Energy levels have been presented in the ground state configuration of Sulphur like ions by Biemont et al. [3]. Theoretical energy levels were presented for 47 low lying levels of Sulphur like ions for z is greater than 18 by Chou et al. [5]. There has been a noticeable interest resulting in experimental and theoretical work in past years about the atomic properties of Cr IX ion, which is a fair indication of their importance in the Astrophysics and atomic physics [6].

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RESEARCH ARTICLE

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Accurate Closed Form expressions for Conductor Loss and Dielectric Loss in Thin Film Microstrip Line

Ritu Bansal, Sanjay Kumar Mishra, and Yogesh Kumar*

In this paper, two improved closed form expressions are presented, namely, conductor loss and dielectric loss. The improved conductor loss closed form expression is perturbation-based model approach suggested by Holloway & Kuester. This model takes into account the frequency-dependent nature of conductivity of thin film conductor and effect of strip thickness. The model of dielectric loss takes into account frequency-dependent loss tangent and effective relative permittivity of dielectric. A comparison of the present models with the experimental results is also presented for the frequency range from 100 to 1000 GHz. Deviations of the models suggested from experimental results are also tabulated. Average deviation and maximum deviation for conductor loss are 9.26 and 11.56, respectively. Also, average deviation and maximum deviation for dielectric loss are 4.89 and 6.67, respectively.

1. Introduction

In today's world, fast speed and small size are the primary requirements of any device. Hence, we can see that the demand of planar structures has increased. This increases the packaging density within multi chip modules and decreases the parasitic reactance compared with conventional circuits. Microstrip lines are preferred over other planar transmission lines due to former's enormous advantages.

In TFML, typical substrate height ranges from 1 to 25 μm, whereas in conventional lines, it lies between 100 and 500 μm. The common dielectrics used in MMIC are BCB (Bis-Benzocyclobutene),[1] Polyimide,[2] SiON,[3] etc. These dielectrics have low relative permittivity of 3, 2.7, and 5, respectively, as compared to the values of relative permittivity for Alumina, Si, and GaAs, i.e., 9.9, 11.9, and 12.9, respectively. These substrates are used in conventional Microstrip lines. It is evident from these values that when we use TFML, the components made out of it are not only smaller in size but also have faster speed, as velocity in the medium is lowered by high value of relative permittivity, which is the case of conventional lines. In TFML, the value of conductor thickness is also low. Typically, conductor thickness is $t \leq 1.5$ μm and line width is in the range of 5–35 μm.

The small dimensions that describe TFMS as shown in **Figure 1** offer several advantages to the microwave circuit designer. Losses in microstrip line are due to many reasons, dominant reasons being finite conductivity of conductor, resulting conductor loss, and finite resistivity of dielectric substrate, resulting dielectric loss in a microstrip line.[4,5]

2. Conductor Loss

In conductor loss, the computation that we have used is perturbation method. This method is based on current density of a strip conductor. It varies as $1/\sqrt{r}$, where r is the distance from the edge. The conductor loss at $r = 0$ has logarithmic divergence. This is due to the reason that the current distribution tends to infinity when it reaches edge of the strip. Such logarithmic divergence can be avoided if the integration is perturbed just before the edges. This distance is known as the stopping distance. Booth and Holloway had presented a closed form expression for conductor loss computation [6]

$$\alpha_C = \frac{R_{SM}}{2\pi^2 Z_0 W} \ln\left(\frac{W}{\Delta} - 1\right) \quad \text{Nepers/meter} \tag{1}$$

Where, R_{sm}

$$R_{SM} = \mu_0 \omega t \, \mathrm{Im}\left(\frac{\cot(k_C t) + \csc(k_C t)}{(k_C t)}\right) \tag{2}$$

$$\text{where,} \quad k_C = \omega\sqrt{\mu_0 \epsilon_0}\left[1 - j\frac{\sigma_C}{\omega \epsilon_0}\right]^{1/2} \tag{3}$$

$$\Delta = \frac{t}{4\pi e^{\pi}} (\Delta = \text{stopping distance}) \tag{4}$$

where, R_{SM} is surface impedance, W is width of the microstrip, k_C is wave number, σ_c is conductivity of conductor, ω is angular frequency, μ_0 is magnetic permeability of vacuum, ϵ_0 is electric permittivity of vacuum, Z_0 is characteristic impedance of microstrip

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An enormous diversity of soliton solutions to the $(2+1)$-dimensional extended shallow water wave equation using three analytical methods

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In this paper, we obtain a variety of analytical wave solutions of a $(2+1)$-dimensional extended shallow water wave equation. The applications of the governing equation are enormous in ocean modeling and investigation of moist-convection properties in atmospheric dynamics. Two powerful mathematical approaches, the $\exp(-\Upsilon(g))$-expansion method (EEM) and the generalized projective Riccati equations method (GPREM), were used to find closed-form traveling wave solutions. In addition, the breather wave solutions were described using the Cole-Hopf transform, derived with the help of Hirota bilinear method (HBM). Eventually, we obtain 46 closed-form solutions in explicit form. The general form of obtained solutions include trigonometric, rational, exponential and hyperbolic function solutions. To illustrate the physical significance of some novel results, we provided contour, two- and three-dimensional graphics under the suitable free choices of unknown parameters. The dynamical shapes of these solutions are one soliton, multiple solitons, kink, anti-kink, lump and periodic solutions. We believe that the applied methods of this work are well-organized, genuine and powerful mathematical tools for solving the nonlinear evolution equations (NLEEs) occurring in the study of ocean science and engineering.

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