4TH ICPIAM

The 4th International Conference on Physical Instrumentations and Advanced Materials

Abstract Book

Organized by :
Department of Physics
Faculty of Science and Technology
Universitas Airlangga

2023

The 4th International Conference on Physical Instrumentations and Advanced Materials

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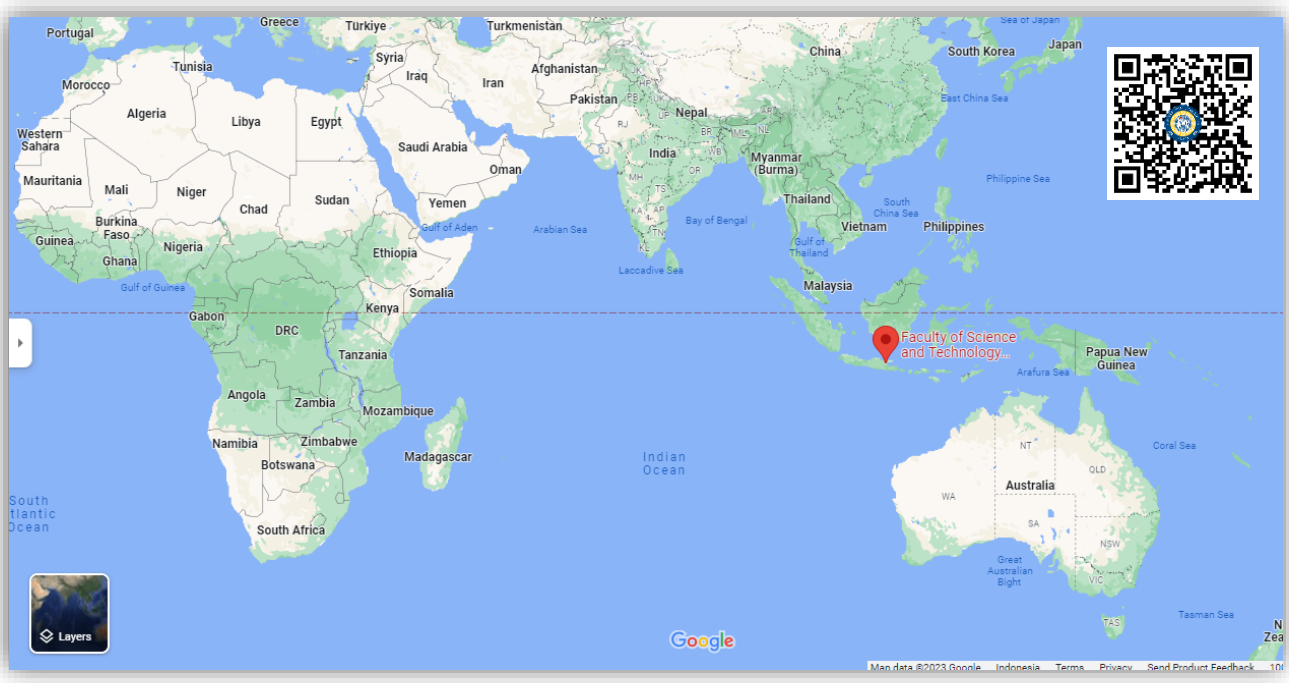
MAP OF FACULTY OF SCIENCE AND TECHNOLOGY

UNIVERSITAS AIRLANGGA



WELCOME TO KAMPUS C, UNIVERSITAS AIRLANGGA

WELCOME TO SURABAYA

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WELCOME MESSAGE FROM DEAN OF FACULTY OF SCIENCE AND TECHNOLOGY, UNIVERSITAS AIRLANGGA

Assalamu'alaikum warahmatullahi wa barakatuh.

On behalf of the Faculty of Science and Technology, Universitas Airlangga; let me express my warm welcome to all of you at Universitas Airlangga, in the 4th International Conference on Physical Instrumentation and Advanced Materials 2023.

It is an honor and joy for us to be host of this conference, where all participants have a chance to present and discuss our knowledge about some aspect of instrumentation and materials, and their prospects in industry application. This conference was organized by Physics Department, Faculty of Science and Technology Universitas Airlangga, in collaboration with Universitas Jember and Institut Teknologi Sumatera.

The 4th ICPIAM 2023 aims to bring together leading academic scientists, researchers, and students to exchange and share experiences and research about some aspects of instrumentation and materials. It also provides the premier interdisciplinary forum for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, concerns, practical challenges encountered, and the solutions adopted in the field of Instrumentation and Materials.

Hopefully, this conference provides a great opportunity for lecturers, researchers and industries to build better communications; this forum can open up opportunities and strengthen collaboration between universities; universitiy and practitioners; also providing benefits for academics, industry, and society as well as realizing sustainable development goals.

Finally, let me congratulate to all of you once again for organizing and participating in this conference. Also to the committee members, moderators, editor boards, sponsors and participants for your kind contributions, I would like to express my gratitude for all the hard work on the succeeding this conference.

Thank you, and enjoy attending the seminar.

Wassalamu'alaikum warahmatullahi wabarakatuh

Surabaya, October 24th 2023

Prof. Dr. Miratul Khasanah, M.Si
Dean of Faculty of Science and Technology, Universitas Airlangga

WELCOME MESSAGE FROM THE ICPIAM GENERAL CHAIR

Assalamualaikum warahmatullohi wabarokatuh

On behalf of steering and organizing committees, I would like to wellcome in 4th international conference physics instrumentation and advanced materials in Airlangga University, surabaya. This conference conduct biannual regularly. The 1st ICPIAM 2016 in Surabaya, the 2nd ICPIAM 2019 in surbaya, the 3rd ICPIAM 2021 by Jember University in Jember, the 4th ICPIAM 2023 in Surabaya and the next 5th ICPIAM will be conducted 2024 by ITERA in Lampung. Start next time ICPIAM will be conducted annually by Airlangga University, Jember University and Institut Teknologi Sumatera. The main objective of this conference is to bring together student researcher and practisioners of physical instrumentation and advanced material to share and disseminate the research.

We are fortune to have world known keynote speaker : Dr. Rifai Chai from Swinburne University Technology , Australia, Prof. Sulaiman W. Harun from University of Malaya, Malaysia, Dr. Paulo Blanco Shancez from Aston University, United Kingdom, and Dr. Suvitha A from CMR Institute of Technology, Bangalore.

We would like especially to thanks the member of local organizing committe who help with all preparation required to make the conference success. Of course special thanks also goes to reviewers, authors and all of participants for their contribution in the 4th ICPIAM 2023 successfull.

In this occasion, I would like to inform you that ICPIAM's authors is come from Malaysia, UK, Bangladesh, Australia, and Indonesia. Besides those regular sessions, ICPIAM also features world-class keynote/plenary speeches and distinguish-invited speakers that reflect the current research and development trends in the aforementioned fields. I believe that we will have high quality discussion in order to increase our excellence in scientific area of physical instrumentation and advanced materials. I also hope that this will become a stepping stone of potensial collaboration between academician and professionals in indonesia in the future.

The last but not least, I would like to acknowladgement with sincere thaks to our sponsors dan supporters. To all our delegates, I hope the 4th ICPIAM 2023 will be memorable not only from the scientific perspective but in the joy of meeting old friends and making news ones.

Wassalamualaikum warohmatullohi wabarokatuh

Best regards

Dr. Khusnul Ain, S.T., M.Si.
ICPIAM Chairman

ICPIAM PLENARY SESSION RULES AND REGULATIONS

Join ZOOM Meeting:
https://zoom.us/j/97030519236?pwd=U3BDTkNDZmgzMTBrMFo5MCswWkxWUT09

1. Participants are required to register on the Zoom application which has been sent by mail or other electronic media
2. Participants do a rename with the following conditions:
   a. Invited guests→ Name
   b. Keynote Speaker → Name
   c. Invited Speaker → Name
   d. Presenter → Room-ID Paper (Example: ICPIAM 1– 67)
   e. Participant → Room-Name (Example: ICPIAM 2-Triwiyanto)
   f. Committee → Room-Com-Name (Example: ICPIAM 3-Com-Triwiyanto)
   g. Moderator → Room-Mod-Name (Example: ICPIAM 4-Mod-Triwiyanto)
   h. QA Assistance → Room-QA-Name (Example: ICPIAM 4-QA-Triwiyanto)
3. Participants' questions can simply be sent via the Chat window which is formally allowed on the Zoom device.
4. Comments and questions are made by fulfilling the 3 (three) elements as follows:
   a. Write a name
   b. Affiliation
   c. Questions addressed to the narrator / who, questions
5. Participants who are entitled to receive certificates provided that they register at the beginning of the day, participate in the event for 2 full days.
6. Material and E-certificates can be downloaded via a link which will be notified by the committee via email of each participant
7. The committee does not accept complaints, if there are errors or errors in writing the name on the E-certificate. The certificate is made according to the attendance list databased form.
8. Please include an active email address: gmail.com (please write the correct email address)
9. Participants must wear a polite and appropriate top, and attend the seminar in a polite position.
10. Host has the right to mute the participant's audio (mute audio) and remove the participant if the participant does not follow the rules and is deemed to be disturbing other participants.
11. Matters that have not been regulated or technical changes will be conveyed during the seminar

ICPIAM Committee

ANNOUNCEMENT ABOUT VIRTUAL CONFERENCE FOR ICPIAM

Dear Authors and Presenters, here is the detailed procedure for attending the virtual conference and parallel room presentations:

1. For the Seminar and Keynote Speaker Presentation events, we will be using Zoom Meeting. Detailed links for these events will be provided in the next few days on our website and email pages.
2. The author has submitted a 10-minute video presentation and presentation slides via Google Form. If you have not submitted the files, please do so as soon as possible.
3. Authors must attend the **parallel session in virtual conference.**
4. The schedule and rooms can be found in next page (for a quick search, just search your paper number)
5. Dry run and Parallel Session will be held using **ZOOM MEETINGS**
   Please **rename** your zoom into this format: **Room_ID Paper_Name.** for example: **Room 1-ID 44_Alfian Putra. AUTHORS must attend parallel sessions**
6. At the dry Session and Parallel Session, we will ask your presence, if you present, we will play the video presentation. After the video ends, you must **answer** the question or discussion that occur during the parallel session for approximately 5 minutes.
7. In case, we do not find your video presentation or presentation slides (or you did not submit those files on Google Form), you will have to present orally.
8. Authors must attend in the parallel session for Q&A session. If author leaves or not attend the parallel session, we will consider the author absent from the presentation (resulting in the paper not being submitted to the targeted publisher).
9. **Please join 15 minutes before the scheduled time** as we need to assign you to the Zoom room.
10. Both the rehearsal and Parallel Session, **WE WILL USE ENGLISH.**
11. Moderator will moderate the opening, question, feedback and closing
12. For Certificates, we will provide a google form to be filled in the parallel session.
13. The **first parallel session** will be held on **24 October 2023, at 13.00 WIB**

We look forward to welcoming you to the ceremony and parallel sessions.

RUNDOWN

Time (GMT+7)	Duration	Agenda		PIC
07.00 – 08.00	60’	Online Registration of Participants		Committee
08.00 – 08.35	**35’**	**Opening Ceremony**	MC:	
08.00 – 08.05	5’	1. Opening	Muhammad Hafizh Athari and Alifiah Qodartin Nisa Budiharjo	
08.05 – 08.07	2’	2. National Anthem of Indonesia Raya		
08.07 – 08.10	3’			
08.10 – 08.20	10’	3. Hymn of Airlangga		
08.20 – 08.30	10’	4. Committee Chairman report	Dr. Khusnul Ain, S.T., M.Si	IT and Web Team
08.30 – 08.35	5’	5. Welcome Speech	Prof. Dr. Miratul Khasanah, M.Si (Dean of Science and Technology Faculty, Universitas Airlangga)	
		6. Do’a	Fawwaz	
08.35 – 09.35	**60’**	**Plenary Session I**	Moderator: Prof. Dr. Retna Apsari, M.Si	
08.35 – 08.20	45’	Keynote speaker I	**Prof. Sulaiman W. Harun** (Head of Department of Electrical Engineering, Faculty of Engineering, Faculty of Engineering)	Committee
08.20 – 08.35	15’	QnA Keynote Speaker I		
09.35 – 10.35	**60’**	**Plenary Session II**	Moderator: Andi Hamim Zaidan, M.Si, Ph.D	
09.35 – 10.20	45’	Keynote speaker II	**Dr. Suvitha A.** (Associate Professor in Department of Physics, CMR Institute of Technology, Bangalore)	Committee
10.20 – 10.35	15’	QnA Keynote Speaker II		
10.35 – 10.45	10’	Break (Traditional Dance)		
10.45 – 11.40	**55’**	**Plenary Session III**	Moderator: Herri Trilaksana, S.Si., M.Si., Ph.D.	
10.40 – 11.25	40’	Keynote speaker III	**Dr. Paula Blanco Sanchez** (Senior lecturer in Chemical Engineering at Aston University)	Committee
11.25 – 11.40	15’			

Time (GMT+7)	Duration	Agenda		PIC
		QnA Keynote Speaker III		
11.40 – 12.40 11.40 – 12.25 12.25 – 12.40	**60'** 45' 15'	**Plenary Session IV** Keynote speaker IV QnA Keynote Speaker IV	Moderator: Akif Rahmatillah, S.T., M.T. **Dr. Rifai Chai** (Senior Lecturer and Academic Director (Partnerships) in the School of Science, Computing and Engineering Technologies, Swinburne University of Technology)	Committee
12.40 – 13.00	20'	Break		Committee
13.00 – 17.00 **15.30 – 16.45 (Break)**	240'	Parallel Session @ 15 minutes (10 minutes presentation+ 5 minutes QnA)	Room 1: Dr. drg. Prihartini Widiyanti, M.Kes., Room 2: Inten Firdhausi Wardhani, S.T., M.Sc. Room 3: E. Edo Yunata, S.Si., M.Si., Ph.D. Room 4: Erwin Sutanto, S.T., M.Sc. Room 5: Endah Purwanti, S.Si., M.T.	Moderator Operator Timekeeper
17.00 – 17.05	5'	Announcement	MC: Muhammad Hafizh Athari and Alifiah Qodartin Nisa Budiharjo	Committee

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PARALLEL SESSION ICPIAM

Room 1 (ICPIAM 1)	
Date and Time	24 October 2023 at 13.00 WIB (Western Indonesia Time)
Link	**https://zoom.us/j/97030519236?pwd=U3BDTkNDZmgzMTBrMFo5MCswWkxWUT09**
Category	**Biomaterials 1**
Moderator **Invited Speaker**	**Dr. drg. Prihartini Widiyanti, S.Bio., M.Kes., CCD.** **Dra. Arry Yuariatun Nurhayati, M.Si.**

No	Time (GMT+7)	ID	Title	Authors
1	13.00 – 13.15	35	The analysis of Semeru Volcanic Ash Erupted in December 2021 on the Growth of Legumes (Mungbean and Soybean) and Its Effect on the Resilience of People	Arry Yuariatun Nurhayati, Rista D Karisa and Yuda C Hariadi
2	13.15 – 13.30	7	Assessing the Antibacterial Potential of Honey Orange Peel Extract: Synthesis and Characterization	Iradisnayanti Sihombing, Evi Suaebah, Ersyzario Edo Yunata and Jan Ady
3	13.30 – 13.45	14	The Effect of Hydroxyapatite-Gelatin Coating Variations on 3D Printing Poly Lactic Acid (PLA) Scaffold with Rhombi-Truncated Cuboctahedron Models	Grace Constella Anastasya Firdauz, Dyah Hikmawati and Ersyzario Edo Yunata
4	13.45 – 14.00	18	Preparation and Characterizations for Barium Titanate Piezoelectric with Polyvinylpyrrolidone Effect	Jan Ady and Andhika Bangun Samudra

No	Time (GMT+7)	ID	Title	Authors
5	14.00 – 14.15	20	Effect of Pore Size Design of PLA (Polylactic Acid) Scaffold Hexagonal Pasteurized Geometry Using the 3D Printing Method on Mechanical Properties	Nabila Safitri, Dyah Hikmawati and Aniek Setiya Budiatin
6	14.15 – 14.30	26	Application of Polycaprolactone/Collagen Biocomposite Coated with Chitosan as Nanofiber for Skin Tissue Engineering in Burn Wounds	Djony Izak Rudyardjo
7	14.30 – 14.45	27	Effect of Addition of Collagen and Elastin to Polycaprolactone-Based Artificial Anterior Cruciate Ligament Scaffold	Nabila Meinisya Sahira, Andreas Charles Raharjo, Dyah Hikmawati, Sofijan Hadi and Aminatun Aminatun
8	14.45 – 15.00	28	Variation of Fiber Directions on The Surface of 3D-Printing Scaffold Based on Polylactic Acid and Polycaprolactone for Anterior Cruciate Ligament Reconstruction	Etik Wahyuni, Dyah Hikmawati, Sofijan Hadi and Aminatun Aminatun
9	15.00 – 15.15	33	Injectable Hydrogel Based of Hyaluronic Acid-Doxycycline for Joint Bearing of Osteoarthritis Case	Prihartini Widiyanti, Muhammad Fabian Daffa Mahendra and Djoni Izak Rudyardjo
10	15.15 – 15.30	41	Polycaprolactone-Polyaniline Alloy in 3D Printing Scaffold as Bone Implant	Fitriyatul Qulub, Arie Wibowo

No	Time (GMT+7)	ID	Title	Authors
11	15.30 – 15.45	Break (15')		
12	15.45-16.00	44	The Effect of TiO2 Addition on Improving the Performance of Zinc Oxide Nanoparticles (ZnO-NPs) as a Sunscreen Formulation	Siswanto Siswanto, Aminatun Aminatun, Ni Kadek Setiari and Vallery Ofelia Viannco Junico

Room 2 (ICPIAM 2)	
Date and Time	24 October 2023 at 13.00 WIB (Western Indonesia Time)
Link	**https://zoom.us/j/97030519236?pwd=U3BDTkNDZmgzMTBrMFo5MCswWkxWUT09**
Category	**Biomaterials 2**
Moderator **Invited Speaker**	**Inten Firdhausi Wardhani, S.T., M.Sc.** **Dr. M V Reddy**

No	Time (GMT+7)	ID	Title	Authors
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2	13.15 – 13.30	47	Antibacterial Effect of Silver Nanoparticles Synthesized by Grape Seed Extract Against Staphylococcus aureus and Escherichia coli	Ahmad Khalil Yaqubi, Suryani Dyah Astuti and Andi Hamim Zaidan
3	13.30 – 13.45	48	Intensifying the characteristics and performance of hydrophobic zeolite produced from bamboo leaves for bioethanol purification	Misbahudin Alhanif, Arinda Yolanica Prastyo, Maulidah az Zahra and Alfian Fadilah Santoso
4	13.45 – 14.00	49	Characteristics of Rice Husk Briquettes with Taro Starch Adhesive (Colocasia esculenta L.)	Nova Anika, Muhammad Agung Ikhwansyah, Muh. Kusmali, Jabosar Ronggur Hamonangan Panjaitan, Harmiansyah and David Septian Sumanto Marpaung
5	14.00 – 14.15	52	Bacterial Cellulose Production from Banana Peel with Ethanol Addition	Jabosar Ronggur Hamonangan Panjaitan and Melinia Wulan Rahmawat

No	Time (GMT+7)	ID	Title	Authors
6	14.15 – 14.30	53	CHARACTERISTICS TEST OF MECHANICAL PROPERTIES AND BIODEGRADATION OF BIOPLASTIC BANANA KEPOK PEEL STARCH AND POLYVINYL ALCOHOL BASED ON REINFORCEMENT CORN HUSK CELLULOSE	Harmiansyah Harmiansyah, Narti Liana, Eka Nurfani and Lathifa Putri Afisna
7	14.30 – 14.45	58	Green Synthesis of Silver Nanoparticles with Green Tea (Camellia sinensis) Extract Bioreductant and Antibacterial Activity Test Against Escherichia Coli and Staphylococcus Aureus Bacteria	Siprianus Somarwain, Aura Adinda, Ummi Hanifah and Suryani Dyah Astuti
8	14.45 – 15.00	60	Green Synthesis Silver Nanoparticle – Senna Alexandrina (AGNPS-SA) Effect to Staphylococcus aureus Bacteria	Khouliya Zalda, Farah Restuadji, Reri Muhammad Ibadurrahman, Suryani Dyah Astuti, Andi Hamim Zaidan and Dezy Zahrotul Istiqomah Nurdin
9	15.00 – 15.15	61	Effect of Green Synthesis Silver Nanoparticle – Senna Alexandrina (AGNPS-SA) to Escherichia Coli Bacteria	Reri Muhammad Ibadurrahman, Farah Restuadji, Khouliya Zalda, Suryani Dyah Astuti, Andi Hamim Zaidan and Dezy Zahrotul Istiqomah Nurdin

No	Time (GMT+7)	ID	Title	Authors
10	15.15 – 15.30	62	Injectable Alginate/Polypyrrole Hydrogel as Therapeutic Candidate for Spinal Cord Injury	Ni Nyoman Ary Dewanthi, Khairun Nisa, Emmanuella Aurelia Rachel Passa, Maria Novi Limantoro and Prihartini Widiyanti
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12	15.45 – 16.00	63	Gelatin-Chitosan-Tannic Acid Composite as a Spring-loaded Silo for Gastroschisis Cases	Alinda Anggraini, Atin Asna Octavia, Muhammad Hafizh Athari, Tarrisa Diandra Putri Wibowo, Sayyidul Istighfar Ittaqillah and Prihartini Widiyanti
13	16.00 – 16.15	64	Biomaterial-Enhanced Hemostatic Sponge for Non-Compressible Bleeding Control	Lale Rozykulyyeva, Prihartini Widiyanti and Suryani Dyah Astuti

Room 3 (ICPIAM 3)	
Date and Time	24 October 2023 at 13.00 WIB (Western Indonesia Time)
Link	**https://zoom.us/j/97030519236?pwd=U3BDTkNDZmgzMTBrMFo5MCswWkxWUT09**
Category	**Advanced Materials**
Moderator **Invited Speaker**	**Ersyzario Edo Yunata, S.Si., M.Si., Ph.D.** **Hadi Teguh Yudistira, S.T., Ph.D.**

No	Time (GMT+7)	ID	Title	Authors
1	13.00 – 13.15	39	Study of Metamaterial as Controlling Electromagnetic Wave Material	Hadi Teguh Yudistira
2	13.15 – 13.30	13	Understanding Corrosion in Coal-Biomass Co-firing with Biomass Ratio through Embedded Corrosion Tests	Silvia Mutimmatus Syaadah, Hubby Izzuddin, Agus Sukarto Wismogroho, Eni Sugiarti, Ahmad Afandi, Wahyu Bambang Widayatno, Jayadi, Didik Aryanto, Jonathan Dian, Ardi Nugroho, Teguh Widjajanto, Agung Purniawan and Sigit Tri Wicaksono
3	13.30 – 13.45	17	Experimental and Numerical Study on Cold-Formed Steel Built-Up Closed C-Section Beams Subjected to Three-Point Flexural Loading	Imam Taufik, Tri Widya Swastika, Sarah Fatihah Nugroho and Heru Purnomo

No	Time (GMT+7)	ID	Title	Authors
4	13.45 – 14.00	25	Bibliometric Analysis of Materials for Railway Brake Blocks	Fahmi Imanullah, Eko Surojo, Aditya Rio Prabowo, Ubaidillah, Zainal Arifin and Kacuk Cikal Nugroho
5	14.00 – 14.15	29	Glass Fiber-Reinforced Polymer packaged Singlemode – Multimode – Singlemode Fiber Structure Sensors for Load/Strain Measurement	I Made Manik Wiradhana, Agus Muhamad Hatta and Doty Dewi Risanti
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7	14.30 – 14.45	43	Effect of ZnO Sputtering Time as Photoanode ITO-PEN/TiO2/ZnO On Microstructure and Optical Properties For Flexible DSSC	Anjar Nur Ramadhani, Markus Diantoro, Herlin Pujiarti and Arif Nur Afandi
8	14.45 – 15.00	45	A Comprehensive Study of Iron Ores from the Area Around Kupang, East Nusa Tenggara	Albert Zicko Johannes, Zakarias Seba Ngara, Jonshon Tarigan and Minsyahril Bukit
9	15.00 – 15.15	46	Quantitative Analysis of Crystalline phase from XRD Charaterization of Kolbano Sand with Profex	Minsyahril Bukit, Jonshon Tarigan and Albert Zicko Johannes
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No	Time (GMT+7)	ID	Title	Authors
			Pre-Treatment on Black Bamboo Strips	Komariah, Muhammad Lubis and Sena Maulana
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12	15.45 – 16.00	59	The Effect of Differences in Intercritical Annealing Temperatures on the Microstructure, Hardness and Tensile Strength of AISI 1020 Steel	Eko Pujiyulianto, Fransisco Dino, Abdul Muhyi, Kardo Rajaguguk and Fajar Paundra

Room 4 (ICPIAM 4)	
Date and Time	24 October 2023 at 13.00 WIB (Western Indonesia Time)
Link	**https://zoom.us/j/97030519236?pwd=U3BDTkNDZmgzMTBrMFo5MCswWkxWUT09**
Category	**Instrumentation**
Moderator **Invited Speaker**	**Erwin Sutanto, S.T., M.Sc.** **Agus Muhamad Hatta, S.T., M.Si, Ph.D**

No	Time (GMT+7)	ID	Title	Authors
1	13.00 – 13.15		Low-Cost Imaging System: Design and Testing for Laboratory-Based Food Security Applications	Agus Muhamad Hatta, S.T., M.Si, Ph.D
2	13.15 – 13.30	1	Integrated Continuous Emission Monitoring System for Environmental Compliance at a Coal-Fueled Steam Turbine Generator Plant	Angata Rismana and Bhakti Yudho S.
3	13.30 – 13.45	4	Development of Photoplethysmography (PPG) as a Non-Invasive Medical Device for Blood Glucose Detection	Yellena Bunga Casimira, Khusnul Ain, Alfian Pramudita, Nuril Ukhrowiyah, Imam Sapuan and Radhite Majid Sukardi
4	13.45 – 14.00	8	Identification Bone Fractures Using Analog Discovery 2-Based Electrical Impedance Spectroscopy	Bayu Ariwanto, Nuril Ukhrowiyah, Amelia Amelia, Inas Amira, Khusnul Ain and Syevana Dita Musvika
5	14.00 – 14.15	9	Fiber Optic Application For Gasoline Density Sensor Using Fiber Taper Structure	Rahmad Reynaldi Kurniawan, Erwin Sutanto and Herri Trilaksana

No	Time (GMT+7)	ID	Title	Authors
6	14.15 – 14.30	10	A Preliminary Study of Meat Type Detection Using Analog Discovery 2-Based Electrical Impedance Spectroscopy	Ade Agung Harnawan, Reri Muhammad Ibadurrahman, Bayu Ariwanto, Imam Sapuan, Farah Restuadji, Khouliya Zalda and Khusnul Ain
7	14.30 – 14.45	19	Modification of Electrical Interconnection System at PT. Pupuk Sriwidjaja Palembang	Ferian Saddhusilza Putra and Bhakti Yudho Suprapto
8	14.45 – 15.00	21	Comparative Analysis of Differential Pressure and Ultrasonic Flow Meter Devices for Exhaust Gas Velocity Measurement in Steam Turbine Generator Chimneys	Angata Rismana, Qiqi Asmara and Bhakti Yudho S.
9	15.00 – 15.15	22	MOVEMENT-RELATED POTENTIAL IN THE EEG SIGNALS AS THE COMPENSATOR IN THE ROLLATORS FOR ASSISTING HUMAN MOBILITY	Khouliya Zalda, Osmalina Nur Rahma, Akif Rahmatillah, Maydiana Nurul Kurniawati, Khusnul Ain and Rifai Chai
10	15.15 – 15.30	23	Control System Design for Lower Limb Robotic Exoskeleton using PID Tuning Fuzzy	Akif Rahmatillah, Aura Adinda, Ummi Hanifah, Muhammad Hafid Fadilah, Riries Rulaningtyas and Harry Septanto
11	15.30 – 15.45	Break (15’)		
12	15.45 – 16.00	31	Short Circuit Analysis Due to Reconfiguration of AC To DC	Adi Kurniawan, Muhammad Raihan Rosulan Indni

No	Time (GMT+7)	ID	Title	Authors
			Electrical Distribution System on Trailing Suction Hopper Dredger (TSHD) Vessel	Kesuma and Indra Ranu Kusuma
13	16.00 – 16.15	36	Fiber Optic Acoustic Sensor for the measurement of amplitude and frequency of Sound Signals with SMS Structure	Frans Rizal Agustiyanto, Agus Muhamad Hatta, Dhany Arifianto, Maulana Putra Santoso and Fadli Ama
14	16.15 – 16.30	37	Analysis of Calf Muscle Contractions in Various Foot Positions Using Accelerometer Sensor on a Mobile Phone	Fadli Ama, Agus Muhamad Hatta, Katherin Indriawati and Frans Rizal Agustiyanto
15	16.30 – 16.45	38	E-Nose Technology for Catfish Identification Based on Aquaculture Environments	Winarno Winarno, Akif Rahmatillah, Erinka Nur Rohmatillah and Suryani Dyah Astuti
16	16.45 – 17.00	50	Utilization of DAQ module and Accelerometer Sensors for Horizontal to Vertical Spectral Ratio (HVSR) Analysis	Risky Martin Antosia, Yudha Styawan, Alhada Farduwin, Intan Andriani Putri and Reza Rizki
17	17.00 – 17.15	54	Smart Comfort: IoT implementation in classroom comfort, E204, ITERA (case study)	Nike Dwi Grevika Drantantiyas, Devi Triana, Muhammad Akbar Deardo and Ahmad Suaif

Room 5 (ICPIAM 5)	
Date and Time	24 October 2023 at 13.00 WIB (Western Indonesia Time)
Link	**https://zoom.us/j/97030519236?pwd=U3BDTkNDZmgzMTBrMFo5MCswWkxWUT09**
Category	**Computation**
Moderator **Invited Speaker**	**Endah Purwanti, S.Si., M.T.** **Dr. Riries Rulaningtyas, M.T.**

No	Time (GMT+7)	ID	Title	Authors
1	13.00 – 13.15		Digital Pathology Virtual Microscope	Dr. Riries Rulaningtyas, M.T.
2	13.15 – 13.30	2	Musculoskeletal Modeling of Walking Gait in Children with Spina Bifida Using OpenSim	Melyna Wahyudi, Alfian Pramudita Putra, Pujiyanto Pujiyanto and Esti Andarini
3	13.30 – 13.45	3	Design of Artificial Intelligence Learning System (AILS) in Data Processing for Complex Engineering Systems in Schools Towards Independent Learning	Soegianto Soelistiono and Wahidin Wahidin
4	13.45 – 14.00	5	Feature Extraction from Brain Mapping Electroencephalogram Signals Using Low-Resolution Electromagnetic Tomography (LORETA)	Osmalina Nur Rahma, Khusnul Ain, Fadli Ama, Alfian Pramudita Putra, Nafisa Rahmatul Laili Alami, Nita Lutfiyah and Khouliya Zalda
5	14.00 – 14.15	6	Artificial Neural Network Performance In PCR Temperature Control Systems	Dewi Anggraeni, Setyawan Purnomo Sakti, Agus Naba and Sugeng Rianto

No	Time (GMT+7)	ID	Title	Authors
6	14.15 – 14.30	11	Squat Posture Recognition System Design For Physical Activity Monitoring	Irfaan Bahardika Daffa Musyafa, Riries Rulaningtyas and Alfian Pramudita Putra
7	14.30 – 14.45	12	Diabetes Detection from Iris Image Using k-Nearest Neighbor Based on Texture Features	Farah Restuadji, Riries Rulaningtyas, Soegianto Soelistiono and Fitriyatul Qulub
8	14.45 – 15.00	24	Finite Element Analysis of Modified Fixation Plates Adjusting Clavicle Morphology	Nathasya Reinelda Noviyadi, Dita Ayu Mayasari, Menik Dwi Kurniatie, Dinda Syaqila Andryani and Talitha Asmaria
9	15.00 – 15.15	30	Urban Heat Island Analysis Based on Landsat 8 OLI/TIRS Data in Jember City Area	Bowo Eko Cahyono, Nyu Herdiyanto Adi Luhur Winasis and Sutisna Sutisna
10	15.15 – 15.30	32	Glaucoma Detection Using Extreme Learning Machine Based on Histogram and Fractal Features from Retina Fundus Images	Endah Purwanti, Mustikaningrum Mustikaningrum and Soegianto Soelistyono
11	15.30 – 15.45	Break (15’)		
12	15.45 – 16.00	42	Computer Vision with Convolutional Neural Network for Product Inspection with Edge Impulse Studio and ESP32-Cam Microcontroller	Ahmad Suaif
13	16.00 – 16.15	55	Inter-Layered Interaction of the Polymeric HCOOH a Density Functional Studies	Septia Eka Marsha Putra, Vera Khoirunisa, Fathan

No	Time (GMT+7)	ID	Title	Authors
				Akbar Nur Habibi and Indah Gumala Andirasdini
14	16.15 – 16.30	56	Thermal Analysis on Heatsink with Variation of 5 Materials Using ANSYS CFD Simulation	Denis Pramudia Putra, Amira Fadhila Khairunnisa, Rusni Khaira Ummah, Rudi Setiawan and Doni Bowo Nugroho
15	16.30 – 16.45	57	Calibration of Sound Processing in BATTLE ROYALE Game Sound Effect and It's Influences on Player's Perception of Direction (Case Study: Player Unknown Battle Ground Mobile)	Sefrani Siregar
16	16.45 – 17.00	65	Heart Attack Risk Detection using the C5.0 Decision Tree Algorithm	Franky Chandra Satria Arisgraha, Khusnul Ain and Sulaiman Syah Alif Permana

Abstract

ID – 01

Integrated Continuous Emission Monitoring System for Environmental Compliance at a Coal-Fueled Steam Turbine Generator Plant

Angata Rismana[1, a)] and Bhakti Yudho S.[2]

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Abstract. The increasing concern over environmental pollution has intensified the need for accurate monitoring and control of emissions from industrial sources. This paper presents a comprehensive study on the deployment of a Continuous Emission Monitoring System (CEMS) at the Steam Turbine Generator (STG) Plant of PT Pupuk Sriwidjaja Palembang, which operates on coal as its primary fuel source. The aim of this study is to provide insights into the utilization and effectiveness of CEMS in tracking and mitigating the emissions produced during the energy generation process. The study focuses on the utilization of advanced gas and particulate analyzers for emissions parameter analysis. Particulate emissions are analyzed using the ENVEA STACK 710 analyzer, which offers accurate and real-time assessment of particulate matter released into the atmosphere. This implementation demonstrates the pivotal role of such monitoring systems in enhancing the operational efficiency of coal-based energy plants while simultaneously minimizing their environmental impact. The outcomes of this research offer valuable insights for both industrial and regulatory stakeholders, while also ensuring compliance with emission standards and fostering sustainable energy generation from coal resources. This study contributes to the growing body of knowledge in emissions monitoring and control, emphasizing the importance of continuous and accurate data acquisition to drive environmentally responsible energy production.

Keywords: Environmental pollution, CEMS, STG Plant, Particulate analyzers, Coal-based energy plants

ID – 02

Musculoskeletal Modeling of Walking Gait in Children with Spina Bifida Using OpenSim

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Abstract. Spina bifida is a congenital disorder that interferes with walking, formed in the womb due to the failure of the neural tube to close during the first week of embryonic development. Therefore, a walking aid in the form of a KAFO is needed to prevent knee joint flexion. This study aimed to determine differences in gait in normal children and children with spina bifida and to determine the effect of using KAFO on the gait of children with spina bifida. These studies analyzed the gait data from 7 normal children and seven spina bifida children. The children with the spina bifida model were modified into seven spina bifida children with the help of KAFO. The data used is secondary data from research subjects at Los Angeles Children's Hospital, available on the SimTK website. Then the data is processed on OpenSim (Inverse Kinematics, Residual Reduction Algorithm, and Static Optimization). The results showed a difference between the gait of normal children and children with spina bifida, which could be observed from the kinetics and kinematics. The p-value <0.05 indicated a significant difference between the two models. In addition, the use of KAFO can impact the gait of spina bifida children by maintaining stability in the knee while walking. But it also raises other problems related to gait deviation because the KAFO used is rigid and does not use forearm crutches.

Keywords: Musculoskeletal Modeling, Spina Bifida, OpenSim, KAFO, Healthcare

ID – 03

Design of Artificial Intelligence Learning System in Data Processing for Complex Engineering Systems in Schools towards Independent Learning

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Abstract. This research presents the implementation of an Artificial Intelligence Learning System (AILS) for data processing in complex engineering systems within educational settings, aimed at fostering student learning independence. AILS combines Natural Language Processing (NLP) using the GPT natural language model, teacher visualization through 3D animation, and integration with the Google Search Engine. The AILS application offers students assistance in comprehending study materials for each chapter using a tablet device, while the teacher serves as a supportive companion in the learning journey. The AILS system empowers students to independently acquire knowledge through tablets, providing access to comprehensive information via NLP and the Google Search Engine. The use of teacher visualization in 3D animation enhances interactivity and engagement during the learning process. With AILS, students can flexibly learn at home or in the classroom, while the teacher assumes the role of a guide and mentor. By applying AILS to complex engineering systems in educational institutions, data processing becomes more efficient and accurate. AILS monitors student learning, offers automatic feedback, and identifies individual student needs. The teacher continues to facilitate a deeper learning experience and supports the development of critical and creative thinking skills. The adoption of AILS is expected to foster greater independence in students' learning and cultivate lifelong learning skills. Moreover, implementing AILS in data processing will enhance the quality and efficiency of engineering systems within educational environments. This research introduces an innovative solution for integrating AI technology in education, striving to achieve the objective of promoting student learning independence in the Society 5.0 era.

Keywords: AILS, Complex Engineering Systems, Data Processing, Independent Learning

ID – 04

Development of Photoplethysmography as a Non-Invasive Medical Device for Blood Glucose Detection

Yellena Bunga Casimira[1,f)], Khusnul Ain[1, 2, a)], Alfian Pramudita[1, 2, b)], Nuril Ukhrowiyah[3,c)], Imam Sapuan[3,d)], and Radhite Majid Sukardi [1,e)]

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Abstract. During diabetes treatment, blood glucose measurement is a task frequently performed by diabetes patients. Traditionally, blood glucose measurement requires blood sampling through needle pricks, which often can lead to discomfort, pain, and infection risk for the patients. Therefore, the development of non-invasive methods for blood glucose detection has become a primary focus of research in the field of medical technology. One promising technology is PPG, which is one of the non-invasive medical devices. PPG measures changes in the volume of blood vessels beneath the skin by measuring light absorbed or reflected by tissues. Essentially, PPG generates optical signals based on changes in blood volume in skin capillaries that reflect the glucose level in the blood. Due to its non-invasive nature, PPG offers significant potential to replace traditional methods that require blood sampling. In recent years, research on the use of PPG for blood glucose detection has seen rapid advancement. This technology leverages advances in signal processing algorithms, sophisticated sensors, and small devices that can be used independently by diabetes patients. This study presents the development of PPG as a non-invasive glucometer that can be used to determine blood glucose levels. Utilizing machine learning (ML), specifically the Artificial Neural Network (ANN), inputs were obtained from several feature extractions, including Body Mass Index (BMI) and from PPG signals, which include Peak-to-Peak Amplitude Standard Deviation (PPAstd), Peak-to-Peak Interval Kurtosis (PPIk), Peak-to-Peak Amplitude Mean Absolute Deviation (PPIMAD), Detrended Fluctuation Analysis (DFA), Power Spectral Density (PSD), and Wavelet Entropy (WE). The research used 31 subjects were 25 subjects as the training dataset and 6 subjects as the test dataset. Blood glucose measurements were conducted on 5 subjects without repetition and 1 subject with five repetitions. The research results show that the obtained correlation coefficients R2 for fasting blood sugar (FBS) and postprandial blood sugar (PBS) were 0.895 and 0.954, respectively. Based on the Clarke Error Grid Analysis (CEGA), the test results are distributed in zone A, which indicates that they are clinically acceptable.

Keywords: Photoplethysmography, Blood glucose detection, Non-invasive, Medical device

ID – 05

Feature Extraction from Brain Mapping Electroencephalogram Signals using Low-Resolution Electromagnetic Tomography (LORETA)

Osmalina Nur Rahma[1, 2, a)], Khusnul Ain[1, b)], Fadli Ama[1,c),] Alfian Pramudita Putra[1, 2, d)], Nafisa Rahmatul Laili Alami[1,e)], Nita Luthfiyah[1,f)], and Khouliya Zalda[1, g)]

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Abstract. Electroencephalography is capable of capturing brain activity for human-machine interaction or controlling exoskeleton movements in rehabilitation robots. An electroencephalogram (EEG) signal is a potential method to distinguish the exoskeleton movement to be performed. Low-Resolution Brain Electromagnetic Tomography (LORETA) is one method for assessment and monitoring for rehabilitation treatment by visualizing EEG signals in 3-dimensional form or brain mapping. Thus, Brain Mapping becomes an alternative to get the right features as input to distinguish movements. This research aims to process and analyze the electroencephalogram (EEG) signal of movement imagery using LORETA to obtain a brain mapping image in 3-dimensional visualization. In addition, it is also to identify the dominant channel with changes in hand grasping and opening imagery movements. This method allows the identification and localization of brain activity. This study collected EEG data from 3 healthy subjects to generate a 3D mapping of the brain activity, especially α and β brainwaves, while doing imagery movements using LORETA. These features include the Region of Interest (ROI) and the intensity of brain activity involved while imagining hand opening and grasping movements. The results of this study show that the LORETA method can perform brain mapping. The ROI results of feature extraction from EEG signals with a t-test statistical test with a significant value ($p<0.05$) are most in channels F7, T7, and P7 in the frontal lobe, temporal lobe, and parietal lobe, respectively, left hemisphere. LORETA can be a good tool for understanding the relationship between brain activity and cognitive function.

Keywords: EEG, LORETA, brain mapping, imagery movement

ID – 06

Artificial Neural Network Performance In PCR Temperature Control Systems

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Abstract. Polymerase chain reaction, or PCR, is a scientific technique for examining DNA. The PCR process works by amplifying, which involves heating the material to a specific setting point. A thermoelectric heating element that is controlled to create the desired condition is used to carry out the heating. PWM (pulse width modulation) is used as a thermoelectric controller to obtain a different temperature response according to the applied voltage. In the tool system that is made, PWM will be used as an input variable because PWM will control the temperature of the thermoelectric, so the temperature will be the output value. A representation of artificial intelligence that can be applied in PCR temperature control systems is an artificial neural network (ANN). Several techniques of ANN, including the Levenber-Marquart (trainlm), the Bayesian regularization (trainbr), and the Scaled Conjugate Gradient (trainscg) algorithms, were compared for performance in this study. The results showed that the Levenber-Marquart method and the Bayesian regularization method both produced the best results in the PCR temperature control system, with an MSE of 0.951268 and 0.952529, respectively. Each algorithm also produced a fairly good regression value of around 0.99, while the scaled conjugate gradient method produced a fairly large MSE of around 2941 and a poor regression value of around 0.64.

Keywords: ANN, PCR, Temperature

ID – 07

Assessing the Antibacterial Potential of Honey Orange Peel Extract: Synthesis and Characterization

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Abstract. Honey orange, a distinct citrus variety known for its honey-like sweetness, thrives abundantly throughout Indonesia, appealing to a broad consumer base. Unfortunately, the waste generated from honey orange peel remains vastly underutilized. Honey orange peel exhibits significant potential as a natural antibacterial source, necessitating an in-depth investigation. The extraction process of honey orange peel was conducted using the Soxhlet method, yielding an extract volume of 585 ml from 122 grams of peel material. The different concentrations (50%, 37.5%, 25%, and 12.5%) were mixed with precursors ($CuSO_4.5H_2O$) for an antibacterial study. The Fourier-Transform Infrared (FTIR) analysis revealed the detection of functional groups of flavonoid compounds in the honey orange peel extract, with additional detection of O-H functional groups at the wavenumber of 3309.24 cm^{-1}. X-ray Diffraction (XRD) testing indicated the formation of copper (II) oxide (CuO) in the volume fraction range of 2% to 25%. Particle Size Analysis (PSA) demonstrated that the concentration variations resulted in particle sizes ranging from 2µm to 5µm. Bacterial testing using the disc diffusion method indicated that bacterial growth was maximally inhibited at concentrations of 12.5% and 25%, resulting in inhibition zones of (26.31 ± 0.16) mm and (25.53 ± 0.31) mm, respectively, against *Escherichia coli*. Based on the characterization results, this study underscores the potential utility of honey orange peel extract as an antibacterial agent.

Keywords: Antibacterial, Honey orange peel, Copper (II) oxide, Flavonoid

ID – 08

Identification Bone Fractures Using Analog Discovery 2-Based Electrical Impedance Spectroscopy

Bayu Ariwanto[1, b)], Nuril Ukhrowiyah[2,a)], Amelia[3,c)], Inas Amira[1,d)], Khusnul Ain[3,e)], Syevana Dita Musvika[1,f)]

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Abstract. According to research findings, the incidence of bone fractures has been increasing year by year in various countries. Although X-rays are a commonly used tool for detecting bone fractures, their long-term use can have side effects on patients. This study used the electrical impedance spectroscopy (EIS) method to obtain real and imaginary impedance values from normal and fracture bone phantoms. Electrical Impedance Spectroscopy (EIS) is an analytical technique used to examine electrical conductivity and impedance properties of materials. The frequency range used in the research was 100 Hz to 1 MHz using the Digilent Analog Discovery 2. The Digilent Analog Discovery 2 is a versatile tool that can be used as a digital oscilloscope, signal generator, impedance analyzer, and power supply. A VCCS (voltage control current source) was designed using the IC OPA2134. Bone phantoms were created using a 3D printer with PolyLactic Acid (PLA) material in the shape of a human femur bone. Measurements were taken under conditions of normal and fractured bone phantoms using six different electrode spacing variations for current injection and voltage reading. The real and imaginary impedance values of the normal and fractured bone phantoms were modeled using Zview software. The measurement results revealed differences in the nyquist plots between normal and fractured bone phantoms with various electrode spacing variations. The value of the R component of the fractured bone phantom was larger than that of the normal bone phantom, while the C component of the fractured bone phantom was smaller than that of the normal bone phantom. The highest sensitivity among several electrode spacing variations was observed in variation B.3 (with electrode spacing I+ and I- at 8 cm, and V+ and V- at 4 cm) with a sensitivity value of 71.54%, while the lowest sensitivity was found in variation A.1 (with electrode spacing I+ and I- at 12 cm, and V+ and V- at 8 cm) at 21.99%.

Keywords: Electrical Impedance Spectroscopy, Impedance, Bone fractur, Analog discovery 2

ID – 09

Fiber Optic Application for Gasoline Density Sensor Using Fiber Taper Structure

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Abstract. Fiber Optic (FO) sensor based using fiber taper structure is proposed and demonstrated experimentally in this paper. This proposed sensor is prepared by flame brushing technique to fabricate fiber taper. The sensing mechanism is that the spectrum's output power and peak wavelength will change when the temperature changes due to the shifting refractive index of the fiber taper surface. The proposed sensor design is tested for three distinct gasoline brands in Indonesia, such as; Pertalite (RON 90), Pertamax (RON 92), and Pertamax Turbo (RON 98). The measured density values for each of them were tabulated. The experimental results show that the sensor sensitivity for Pertalite, Pertamax, and Pertamax Turbo samples are 0.0457 dBm/kg/m^3, 0.0473 dBm/kg/m^3, and 0.0843 dBm/kg/m^3. The sensor resolution for these samples is 0.5655 kg/m^3, 0.4615 kg/m^3, and 0.5055 kg/m^3 in the temperature range from 27°C to 39°C.

Keywords: Density Sensor, Fiber Optic Sensor, Fiber Taper, Gasoline, Energy Efficiency

ID – 10

A Preliminary Study of Meat Type Detection Using Analog Discovery 2-Based Electrical Impedance Spectroscopy

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Abstract. This research constitutes a preliminary study aimed at exploring the potential use of analog discovery 2-based electrical impedance spectroscopy (EIS) in meat type detection. Identifying meat types holds significant importance in various applications, including the food industry and quality control of food products. Current conventional methods for distinguishing meat types often require a considerable amount of time and expense. This research utilizes the Analog Discovery 2, an electronic-based device capable of measuring the electrical impedance of various meat types within a frequency range of 100 Hz to 1 MHz. The meat types examined include chicken, beef, and pork, which are commonly consumed varieties. Measurement results using six different electrode model variations reveal differences in real impedance, imaginary impedance, and Nyquist plots among chicken, beef, and pork meat. The preliminary findings of this study indicate that Analog Discovery 2-based EIS holds potential for meat type detection. Although further development is needed, this research paves the way for the use of EIS technology to ensure the quality of meat products and the development of more advanced systems for rapid and efficient meat type identification. In conclusion, this study provides a strong foundation for further advancements in the field of meat type detection using Analog Discovery 2-based EIS.

Keywords: Electrical Impedance Spectroscopy, Impedance, Meat, Analog discovery 2

ID – 11

Squat Posture Recognition System Design for Physical Activity Monitoring

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Abstract. The COVID-19 pandemic and its variants have affected the health and well-being of people around the world. Governments are using a number of tactics to control the spread of COVID-19, including the implementation of social distancing measures. Restrictions on access to sports facilities, fitness centers and parks have resulted in a significant decrease in physical activity. At-home exercise by using a variety of safe, basic, and easy-to-implement exercise routines is ideal for avoiding the coronavirus and maintaining fitness levels. One such exercise is the squat, which incorporates elements of common functional movements such as climbing and descending stairs. Although home exercise is safe, easy, cheap, and affordable, some people may lose motivation and enthusiasm to do it due to lack of knowledge, supervision, and accessible resources. This research aims to build a squat posture recognition system that can replace the role of humans to supervise physical activity performed at home by utilizing MediaPipe Pose. The system will calculate the angle formed at the knee of the subjects' right leg and validate the squat movement performed by the subjects. If the subject does not meet the criteria for a correct squat, the system will provide feedback to improve the squat. System testing was conducted at three angle variations, which are 70°, 90°, and 110°. The results obtained show that the system has a linearity of 95.73%, a sensitivity of 97.1%, an accuracy of 96.11%, 95.46% and 93.15% in the 70°, 90° and 110° angle variations, respectively, and a precision indicated by the standard deviation of 4.49, 4.79 and 4.90 in the 70°, 90° and 110° angle variations, respectively. This shows that the system can replace the role of humans to supervise squat movements with excellence.

Keywords: Squat, MediaPipe Pose, Human Activity Recognition, Exercise movement correction

ID – 12

Diabetes Detection from Iris Image Using k-Nearest Neighbor Based on Texture Features

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Abstract. Diabetes is a chronic disease characterized by disorders in the production or use of insulin in the body. Insulin is a hormone produced by pancreatic beta cells, essential in regulating blood glucose levels. One way to detect diabetes is to use iridology. Iridology is a field of study that can detect bodily abnormalities through the eye's iris. Iridologists analyze the characteristics of the iris using a biomicroscope. This causes the results of analysis and diagnosis of disease to be subjective and take a long time. This research aims to build a program that is capable of detecting diabetes from iris images using k-Nearest Neighbor (k-NN) by comparing two texture feature extraction methods, namely Gray Level Co-Occurence Matrix (GLCM) and Gray Level Run Length Matrix (GLRLM). For GLCM, the features used are contrast, dissimilarity, homogeneity, energy, and correlation, while for GLRLM, the features used are short-run emphasis (SRE), long-run emphasis (LRE), gray-level non-uniformity (GLN), run percentage (RP), and run length non-uniformity (RLN). These features are then combined as input for the classification process of diabetic and normal patients using k-NN. The data used in this study were 140 eye images consisting of 70 eye images of diabetes patients and 70 normal eye images. The results showed that the accuracy of diabetes detection using GLCM feature extraction was better than GLRLM. The highest accuracy result with GLCM is 80.95%, while with GLRLM, it is 71.43%.

Keywords: Diabetes, Iris, Texture features, Gray Level Co-occurrence Matrix, Gray Level Run Length Matrix, k-Nearest Neighbor

ID – 13

Understanding Corrosion in Coal-Biomass Co-firing with Biomass Ratio through Embedded Corrosion Tests

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Abstract. Co-firing programs with biomass in the coal-fired power plants help reduce CO2 emissions and reliance on fossil fuels. Biomass, on other hand, contain highly corrosive materials such as chlorine (Cl2) and alkaline chlorides (KCl and NaCl) which can accelerate the corrosion rate during combustion. This study aims to determine the corrosion behavior and analyze the effect of fly ash from Stoker, Pulverized Coal (PC), and Circulating Fluidized Bed (CFB), and 2-5% biomass. The corrosion testing method used in this study was the embedded test (ISO 17248) with fly ash and biomass powder. Mass gain of samples were measured every 20-hour cycle. Scanning Electron Microscopy-Energy Dispersion X-ray (SEM-EDS) and X-ray Diffraction (XRD) characterizations were performed to determine the morphology, distribution of elements and the phases formed on the sample surface after the corrosion test. The results showed that the fly ash stoker had the higher corrosion mass gain than fly ash PC and CFB. Also, more biomass addition led to increase greater the corrosion products formed on the sample surfaces, which was shown by 5 wt.% biomass addition with the corrosion mass gain of 7.39 mg/cm2. The formation of Fe2O3 oxide scales and metallic chloride FeCl2 phase are observed on the sample surface indicating the influence of chlorine and alkali chloride contained in the biomass leading to the accelerated corrosion process and rapid degradation materials.

Keywords: Biomass, Coal Co-firing, Chlorine, Embedded Corrosion Test, Fly Ash

ID – 14

The Effect of Hydroxyapatite-Gelatin Coating Variations on 3D Printed Poly Lactic Acid (PLA) Scaffold with Rhombi-Truncated Cuboctahedron Models

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Abstract. Having surface properties that can support cell attachment and growth is an important requirement in making scaffolds as biomaterial implants. This study focused on the surface modification of Poly Lactic Acid (PLA) 3D printing scaffold with rhombi-truncated cuboctahedron unit geometry model using hydroxyapatite-gelatin composite to overcome bone fracture cases. The scaffold was fabricated from PLA filaments using 3d printer technology with Fused Deposition Modelling (FDM) technique. Hydroxyapatite-gelatin composites were made by giving variations in the composition of 55:45, 60:40, 65:35, 70:30, and 75.25 (%wt) which were then coated on the scaffold by dip coating method. The results of the characterization showed that after the hydroxyapatite-gelatin coated scaffold, a layer was formed on it with a thickness of 80 - 216 μm, a pore diameter of about 216 - 682 μm, and a surface roughness of 3.294 - 22.127 μm. The contact angle test results showed a decrease of 49.75º - 86.11º, indicating that the scaffold is more hydrophilic than before. Thus, it can be concluded that modifications to the surface of the scaffold can have an influence on the characterization results. In this study, the variation with 70:30 composition best fulfils the scaffold criteria for bone tissue engineering compared to other variations.

Keywords: Scaffold, PLA, 3D Printing, Hydroxyapatite, Gelatin, Surface modification

ID – 17

Experimental and Numerical Study of Cold-Formed Steel Built-Up Closed C-Section Beams Subjected to Three-Point Flexural Loading

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Abstract. In recent years, cold-formed steel (CFS) has been increasingly used in construction. However, the thin-walled behavior makes it susceptible to premature buckling and instability. This paper mainly describes the numerical and experimental research on the strength and characteristics of Cold-Formed Steel Built-Up Closed C-Section Beams. This study used a 75 × 35 × 0.75 mm cross-section which was arranged to face each other to form a box using self-drilling screws. Three specimens were loaded under three-point flexural loading. The tested specimen was simply supported. Experimental tests were carried out using the Universal Testing Machine (UTM), with a constant rate of 0.5 mm/min for all samples. The numerical model was developed by using finite element software Midas FEA 2016. Non-linear stress-strain behavior for CFS, geometric imperfections, the screws modelling strategy, and the contact pairs between the CFS components were considered in this study. The results show that structural behaviors of cold-formed steel built-up closed C-section beams are greatly affected by the distance of tie constraint at screws. The results of finite element analysis and experiment closely matched each other in terms of load capacity, moment-curvature and failure.

Keywords: Cold-formed steel, Built-up closed C-section, Midas FEA 2016, Tie constraint at screw

ID – 18

Preparation and Characterizations for Barium Titanate Piezoelectric with Polyvinylpyrrolidone Effect

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Abstract. It has been obtained the barium titanate powder for piezoelectric uses later while that previously added by polyvinylpyrrolidone effect in the weight percentage of solution concentrations in this research with sol gel preparation technique and in the several characterizations was conducted before. There are four samples was found, then XRD results was indicated the crystal structure in tetragonal system. Meanwhile, particle size of the three samples have been described by using PSA and was obtained their values average ~40 nm to ~90 nm, with 60% in percentage of intensity count and remains over 40% in percentage of intensity count is valued in ~100 nm to ~175 nm. These all characterizations tend to describe the four samples of barium titanate powder is satisfied to piezoelectric properties.

Keywords: Sol-Gel Method, Barium Titanate, Polyvinylpyrrolidone, Piezoelectric

ID – 19

Modification of Electrical Interconnection System at PT. Pupuk Sriwidjaja Palembang

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Abstract. Electrical systems play a crucial role in our modern world, powering everything from our homes to our industries. One key component of these systems is the interconnection switchgear, which enables the safe and reliable distribution of electrical power. A safe and reliable electrical system is one of the important factors in an industry. A reliable electrical system can reduce the potential of unscheduled shutdowns. PT Pupuk Sriwidjaja Palembang as one of the producers for the fertilizer industry in Indonesia requires a reliable electrical system for running the fertilizer plant operations. PT Pupuk Sriwidjaja Palembang itself already has a fairly reliable electricity system that is 4 (four) Fertilizer Plants which each of the plant has own power plant (Gas Turbine Generator (GTG)) where all the factories and plants are parallel interconnected in an interconnection switchgear. In connection with the development plant of the Pusri 2B Plant and the Steam Turbine Generator (STG) Plant, modifications are needed in the electrical interconnection system of PT Pusri Palembang. Studies are needed to deliver reliable electrical system modifications with the addition of a new factory (Pusri 2B) and a new power plant (Steam Turbin Generator (STG)) at PT Pusri Palembang.

Keywords: Interconnection, Switchgear, Generator, Reliable

ID – 20

Effect of Pore Size Design of PLA (Polylactic Acid) Scaffold Hexagonal Pasteurized Geometry Using the 3D Printing Method on Mechanical Properties

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Abstract. Fracture healing can be done by bone repair through tissue engineering reconstruction. Scaffold is a three-dimensional bone scaffold used for bone cell growth framework. The purpose of this study was to determine the effect of pore size variation on the mechanical properties and characteristics of scaffolds and to determine the pore size most suitable for human bone criteria. The scaffold geometry design used was hexagonal with pore size variations of 600 µm, 800 µm, 1000 µm, and 1200 µm printed using PLA material with Fused Deposition Modeling (FDM) 3D printing method. The scaffold was injected with Injectable Bone Substitute (IBS) paste synthesized from hydroxyapatite, alendronate, gelatin and hydroxypropyl methylcellulose (HPMC). Digital microscope test results showed the molded pore sizes of 596,00 µm, 795,50 µm, 993,00 µm, and 1197,50 µm. FTIR test results showed the presence of phosphate and amine functional groups as constituents of the IBS paste composition. The tensile and compressive test results showed a negative trend between the pore size variation and the compressive and tensile strength values. The addition of IBS affects the tensile strength of the scaffold, especially at size 600 µm, from 11,608 MPa to 12,989 MPa, while the compressive strength from 82,11 MPa to 135,22 MPa. The porosity and degradation test percentage results show that the scaffold can support bone tissue engineering. Thus, the scaffold with a pore size of 600 µm is a bone scaffold that meets the criteria of human bone.

Keywords: 3D Printing Scaffold, Hexagonal, Pore Size, Injectable Bone Substitute (IBS)

ID – 21

Comparative Analysis of Differential Pressure and Ultrasonic Flow Meter Devices for Exhaust Gas Velocity Measurement in Steam Turbine Generator Chimneys

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Abstract. Accurate measurement of exhaust gas velocity in steam turbine generator chimneys plays a pivotal role in understanding plant's performance, complying with emissions regulations, and ensuring safe operation of power plants. This study compares two methods for measuring exhaust gas velocity in steam turbine generator chimneys: Differential Pressure (DP) based flow meters and Ultrasonic Flow Meters (UFMs). The DP method uses Bernoulli's equation to correlate pressure drop across an obstruction with velocity squared, while UFM employs Doppler or Transit-Time principles to gauge particle velocity. DP demonstrates superior accuracy and reliability, especially amidst varying gas compositions and temperatures. Conversely, UFMs are sensitive to particle concentration and temperature, impacting accuracy. DP installation is straightforward, involving probe insertion, whereas UFM requires precise transducer alignment, making it more complex. DP is economically favorable due to simpler installation and robustness, resulting in lower costs. UFMs, with intricate alignment needs, require higher initial investment and are more vulnerable to operational variations. The study highlights DP's superiority due to accuracy, reliability, easy installation, and cost-effectiveness, favoring optimized turbine performance and compliance with standards. These findings aid decision-making in selecting the right flow measurement technique for steam turbine generator chimneys.

Keywords: Differential Pressure, Ultrasonic Flowmeters, Exhaust Gas Velocity, Steam Turbine Generator Chimneys, Accuracy and Reliability

ID – 22

Movement-Related Potential in The EEG Signals as The Compensator in The Rollators for Assisting Human Mobility

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Abstract. Rollators or wheelchairs have been developed into intelligent rollators that can navigate semiautonomous, controlled using a joystick. This smart wheelchair still limits people with disability in the upper and lower extremity since they could not move the joystick by hand. Thus, this study aims to design a rollator based on different facial expressions as a movement-related potential in the EEG signal to assist people with disabilities. This study utilized EMOTIV EPOC+ headset technology to obtain EEG signals while doing several facial expressions. The EEG signals were then processed using Discrete Wavelet Transforms (DWT) to generate the Mu and Beta rhythm that decreases or increases while the facial expressions change. The facial expressions were then classified using the ELM based on the suppression of the Mu and Beta rhythms, and the result would be transferred to Arduino to move the rollator forward, backward, or stop through serial communication. The best training and testing results from ELM were obtained using at least 30 hidden neurons. The offline test results from this method show an accuracy range of 86.7-93.3%, while real-time system testing has a success percentage range of 52%-88%. The accuracy proved that the movement-related potential from a facial expression could be helpful for BCI even though this system still needs to be improved by adding more features to differentiate complex movements and reduce the delay in the real-time process so that the rollator could move in different directions precisely.

Keywords: Electroencephalogram (EEG), facial expression, Extreme Learning Machine (ELM), rollator, Brain-Computer Interface (BCI)

ID – 23

Control System Design for Lower Limb Robotic Exoskeleton using PID with Fuzzy Tuning

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Abstract. Lower Limb Robotic Exoskeleton (LLRE) is an integration of mobile sensing, control, information and computing that can be used to augment or enhance human physiological functions. In the LLRE there is a control system that functions to control system performance. In this study, the Proportional-Integral-Derivative (PID) control system was used. The PID control performance is affected by the PID parameter values. To get the optimal PID parameter value, a tuning method is needed on the PID control. One of the tuning methods that can be used is Fuzzy Logic. The aim of this research is to develop a tuning method for PID control using Fuzzy Logic. In this study, the design of the Fuzzy algorithm for PID control was carried out. After designing the algorithm, the SILS design was carried out and the output of the experiments was analyzed. In this study, step-response and sine-response tests were carried out. Then, the results of Fuzzy tuning are compared with Ziegler-Nichols (ZN). The result of this study is that the Fuzzy tuning has better performance than the ZN tuning. After that, the SILS test was carried out. SILS is used as a simulation method to observe the performance of the LLRE control system. The results of the SILS test show that the system performance when built by SILS is better than MILS.

Keywords: PID, Exoskeleton, Robotics, Fuzzy Logic, Software-in-the-loop Simulation

ID – 24

Finite Element Analysis of Modified Fixation Plates Adjusting Clavicle Morphology

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Abstract. Clavicle fractures often occur in the mid-shaft area of the human clavicle bone. A treatment can be done using a plate fixation method, with a design according to the morphology of the patient clavicle bone. However, implant failure can still occur even after adjusting for bone morphology. This research aims to understand the biomechanical properties of the human clavicle bone plate using the finite element analysis method, mainly to find the Von Misses stress (VMS). The simulation is carried out on a patient-specific clavicle bone plate placed on the superior face of the human clavicle bone. After applying a bone plate load of 100 N, the VMS will indicate if the bone can withstand the load. Our analysis consisted of VMS value and displacement between or designed clavicle bone plate with the clavicle bone, showing an excellent stress-shielding ability to accelerate bone healing. Our modified plate fixation could withstand the load and is a good treatment for clavicle fractures. Our plate fixation can significantly stabilize the fracture, maintain good stress levels, and can be recommended for treating midshaft fractures.

Keywords: Bone Plate, Collar Bone Implant, Personal-Specific Implant, Computer-Aided Design, Computer-Aided Engineering

ID – 25

Bibliometric Analysis of Materials for Railway Brake Blocks

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Abstract. The train remains one of the Indonesian people's preferred modes of transportation. The braking system is an important component in the railroad industry. Because of its working principle of converting kinetic energy into heat energy due to friction between the brake block and the train wheels, the braking system is an important aspect of supporting safety in transport vehicles. This study also emphasizes the significance of bibliometric analysis through a review of railway brake block material based on data published in Scopus. Bibliometric analysis is useful in determining trends or growth patterns related to the topic under study as well as the shortcomings of related research. The findings of this study will be beneficial to new researchers interested in railroad brake block linings. In addition, the assertion of collaboration in the field of railway brake block linings shows that China contributed the largest amount of collaboration between countries. Logically, China is also the country in which most articles in this field are published. This study also presents a simple and brief estimate of the research and development opportunities that can be drawn from the field of railway brake block linings. The results of the analysis show that further research is still needed in the field of railway brake block linings for the development of a railway brake block dynamometer.

Keywords: Bibliometric, Brake Block, Dynamometer, Railways

ID – 26

Application of Polycaprolactone/Collagen Biocomposite Coated with Chitosan as Nanofiber for Skin Tissue Engineering in Burn Wounds

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Abstract. The most common cause of skin tissue damage is burns. Burns are a type of skin tissue damage due to exposure to heat sources such as fire with a percentage of 53.1%. One of the strategies for handling burns case is the application of skin tissue engineering using nanofiber. This study aims to determine the effect of variations in chitosan immersion times for 1 hour, 1.5 hours, 2 hours, 2.5 hours, and 3 hours on the results and characteristics of PCL/collagen coated with chitosan as nanofibers for skin tissue engineering in burns. The production of nanofibers is carried out using the electrospinning technique with the following parameters: the distance between the collector and the needle tip is 15 cm, the flow rate is 0.5 ml/minute, the voltage is 15 kV, and the drum collector rotation of 162 rpm. The characterizations used in this study were FTIR test, SEM morphology test, swelling test, degradation test, antibacterial test, and tensile strength test. The results of the FTIR test showed that there were no significant differences in the functional groups of the 5 samples. All samples have a diameter <1000 nm which indicates they are still in the nano category. The SEM test results showed that the diameter of the fiber was around 675± 13.85 – 886 ± 29.03 nm, the swelling test showed the percentage of absorption was around 78,85±18,66% - 213,78±68,01%, the degradation test showed that the degradation rate around 0.00007 – 0.0003 grams/day, the antibacterial test showed the presence of the resistance to bacteria is around 2.37±1.1mm – 22.4±5.17 mm, and the tensile strength test is around 1.86 – 3.25 MPa. The sample with the best variation of chitosan immersion time was immersion for 3 hours for tissue engineering in burns based on the SEM test was 675 ± 13.85 nm, the highest percentage of swelling test results was 213.78±68.01%, the highest degradation rate is 0.0003 grams/day, the antibacterial test results using Staphylococcus aureus bacteria showed a very strong category because the diameter of the inhibition zone was 22.4±5.17 mm, and the tensile strength test results were 3.25 MPa.

Keywords: Electrospinning, PCL, Collagen, Chitosan, Skin, Burns, Nanofiber

ID – 27

Effect of Addition of Collagen and Elastin to Polycaprolactone-Based Artificial Anterior Cruciate Ligament Scaffold

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Abstract. Anterior cruciate ligament (ACL) injuries significantly increased between 2014 and 2015, with almost 200,000 instances reported yearly in the US. ACL rupture happens when the ligament is ripped, either totally or partially, which frequently happens in people who are involved in sports. It results from movements like hip adduction, flexion, knee valgus, and tibia twisting and is brought on by a non-contact process when the foot posture is unstable. ACL reconstruction surgery is one therapy option, and because of its biocompatibility and mechanical qualities, polycaprolactone (PCL) has gained popularity as a biomaterial of choice. The study is still being done to develop mechanical qualities appropriate for the human ACL, taking into consideration other constituents like collagen and elastin. With a better combination of biomaterials, this study seeks to establish a more efficient method of treating ACL injuries. With the combination of collagen/elastin to a polycaprolactone-based scaffold synthesized using the electrospinning methods. The cytotoxicity, mechanics, and water contact angle were reviewed to see performance of the resulting scaffold. Based on the cytotoxicity test showed that the ACL scaffold sample was nontoxic with the highest cell viability reaching 99.08%. The modulus of elasticity results is in the range of 5.29-8.97 MPa. The contact angle test results showed that the sample was hydrophilic. PCL/collagen/elastin scaffold can be an alternative treatment for ACL injuries.

Keywords: ACL, Scaffold, PCL, Collagen, Elastin

ID – 28

Variation of Fiber Directions on the Surface of 3D-Printed Polylactic Acid and Polycaprolactone Based Scaffold for Anterior Cruciate Ligament Reconstruction

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Abstract. Anterior Cruciate Ligament (ACL) injuries occur frequently in athletes, and their incidence rate is currently increasing. The recovery from ACL injuries typically involves Anterior Cruciate Ligament Reconstruction (ACLR) surgery, which unfortunately has a recurrence rate of 94% due to a lower biomechanical repair capability compared to that of original tissue. Consequently, various studies have been conducted with the goal in creating artificial ACLs with biomechanical properties resembling the original. Hence, this study aims to investigate the impact of variations in fiber directions and braid threads on the scaffold's surface using 3D-Printing with Polylactid acid (PLA) and Polycaprolactone (PCL) materials. The samples' variations included 0° fiber surface angle, 45° fiber surface angle, and 90° fiber surface angle. Several tests were performed to assess the scaffold's characteristics, including tensile tests, contact angle tests, and degradation tests. The results revealed that the PLA scaffold material exhibited Ultimate Tensile Strength (UTS) values and elastic modulus that significantly deviate from the original ACL values. The UTS values ranged from 10.08 MPa to 25.07 MPa, and the elastic modulus ranged from 179.84 MPa to 272.39 MPa. On the other hand, the PCL material met the original ACL value for elastic modulus (ranging from 98.34 MPa to 114.57 MPa) but it significantly deviated below the expected value for UTS (ranging from 1.50 MPa to 3.38 MPa). The contact angle test indicated that both PLA and PCL materials can be adapted for ACL reconstructions due to their hydrophilic properties. Furthermore, all PLA-PCL samples completely degraded within 6 months. In sum, the characterization results reveal that all samples have met the criteria for ACL reconstruction except for the mechanical strength. The orientation of the fibers significantly affects the tensile test, with fibers in the same direction demonstrating enhanced load-bearing capacity, while arbitrary fiber orientations result in weaker tensile strength. Meanwhile, the contact angle test and degradation are primarily determined by material selection.

Keywords: ACL, Scaffold, PCL, PLA, Fiber Direction

ID – 29

Glass Fiber-Reinforced Polymer packaged Singlemode – Multimode – Singlemode Fiber Structure Sensors for Load/Strain Measurement

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Abstract. Conventional strain sensors such as strain gauges are widely used for measuring strain for industrial part materials that are made of glass fiber reinforced polymer (GFRP) composite. However, these sensors are vulnerable to electromagnetic interference. In this study, we implemented a singlemode – multimode – singlemode (SMS) fiber structure as a load sensor or a strain sensor for GFRP composite materials. The SMS fiber structure sensor is embedded in the surface of GFRP composites with epoxy resin. This experiment's test uses the middle and side load test and flexural strain test. The load test is carried out with middle and side load tests every 0 – 20 N with sampling every 2 N. Followed by flexural strain test in the middle section from 0 – 80% strain with sampling every 20%. From the experiment results, the optical power output of the sensor on the middle load test was nearly constant in the range of -7.5 dBm to -7.67 dBm from 0 to 18 N and decreased to -15.6 dBm at 20 N. The nearly same thing happened on the side load test. At 12 N load, the output power output was greatly decreased to -24.39 dBm. The flexural strain test also results in a nearly constant output power output in the range of -7.55 dBm to -7.89 dBm from 0 to 40% strain and greatly decreased to -50 dBm at 60% strain. The GFRP packaged SMS fiber structure sensors can measure both load and strain and can be implemented to various structural monitoring systems.

Keywords: SMS fiber structure, Strain sensor, Load sensor, Glass fiber reinforced polymer, Composite

ID – 30

Urban Heat Island Analysis Based on Landsat 8 OLI/TIRS Data in Jember City Area

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Abstract. Urbanization causes increasing population in urban areas and reducing green open space which can lead to the Urban Heat Island (UHI) phenomenon. Remote sensing that utilizes satellite data such as Landsat 8 is widely used to observe the Earth's surface. The Landsat 8 satellite has various sensors, one of which is a temperature sensor that can be used for Land Surface Temperature (SPL) observation. Land surface temperature and vegetation index are parameters used to describe temperature conditions in urban areas and observe UHI phenomena that occur. This research was conducted to observe the UHI phenomenon in the urban area of Jember Regency using Landsat 8 data from 2018 to 2022. UHI scores in this study were grouped into five classes. The study results show that the urban area of Jember has experienced with UHI phenomenon which occurs every year and tends to be concentrated in the downtown area, then spreads widely as non-vegetated land areas increase.

Keywords: Urban, Urbanization, Land Surface Temperature, Urban Heat Island

ID – 31

Short Circuit Analysis Due to Reconfiguration of AC To DC Electrical Distribution System on Trailing Suction Hopper Dredger (TSHD) Vessel

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Abstract. Direct current (DC) electrical distribution system has been emerging recently. including for ship applications. However, for ship applications, the development of DC distribution system has been limited for electric-propelled ship. Since ship in Indonesia is dominated with non-electric-propelled ship, the investigation of the use of DC distribution system in such a ship is required. One of the most important aspects need to be investigated is short circuit value since it also determines the amount of protection in the system. In this study, the use of simulation software was carried out to compare the amount of short circuit current that contributes to each type of distribution, either in conventional AC or after reconfigured to the DC system. The simulation process is carried out on each bus in the four main conditions of the ship, namely seagoing, maneuvering, dredging, and at port. The results show that the average value of the short circuit current decreased significantly with the DC distribution system. In dredging conditions where most equipment operates, there is a decrease of up to 85.12% from those before reconfiguration the short circuit current is 5.421 kA, while after reconfiguration the value is only 0.807 kA. The biggest drop occurred in at-port conditions with a decrease of 93.11%. With a decrease in the value of the short circuit current that occurs, it is expected to provide benefits, namely reducing the risk of damage that occurs due to too large a current value and increasing the reliability of the distribution cable.

Keywords: Modern Electricity, Numerical Analysis, Short Circuit Current, System Safety

ID – 32

Glaucoma Detection Using Extreme Learning Machine Based on Histogram and Fractal Features from Retina Fundus Images

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Abstract. Glaucoma is an eye disease that damages the Optic Nerve Head (ONH) causing progressive and irreversible vision loss. The sufferer often goes unnoticed by glaucoma because the symptoms do not appear in the early stages. If it is in a chronic condition, glaucoma cannot be cured and can cause permanent blindness. The prevalence of glaucoma cases in Indonesia is quite high and the majority of sufferers are still of productive age. One of the examinations for diagnosing glaucoma is fundoscopy which is carried out to evaluate the back of the eye, the fundus of the retina. However, this examination is still carried out manually, the results of which depend very much on the doctor's skill and experience. This allows reading errors to occur so that the diagnosis results become less accurate. The aim of this research is to develop an algorithm for automatic detection of glaucoma based on artificial neural networks from fundus images. Fundus image extraction uses histogram features (mean, standard deviation and skewness) combined with fractal features. Glaucoma classification uses Extreme Learning Machine (ELM) with variations in the number of neurons in the hidden layer, 5 neurons to 70 neurons. The test results show the best performance of ELM with fractal features and a combination of histogram - fractal features, respectively, 77.08% and 100%.

Keywords: Extreme learning machine, Fractal, Fundus images, Glaucoma, Histogram

ID – 33

Injectable Hydrogel Based of Hyaluronic Acid-Doxycycline for Joint Bearing of Osteoarthritis Cases

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Abstract. Osteoarthritis (OA) is degenerative disease of the knee joint that causes excruciating pain. It is resulted stiffness and limited range of the joint motion. Therapy using hyaluronic acid hydrogel only is not optimal yet for osteoarthritis. The HA-DOX hydrogel may be associated with increased viscoelasticity and anti-inflammatory effect as the background of this study. This study aims are to determine the in vitro characterization of hyaluronic acid-doxycycline (HA-DOX) with variations of (A) HA Only, (B) HA-DOX 0.71 mg; (C) HA-DOX 1.43 mg; and (D) HA-DOX 2.86 mg as joint bearing hydrogel through the test of Scanning electron Microscope (SEM), Fourier-transform infrared spectroscopy (FTIR) tensile strength test, and injectability test and to know the best composition of the entire sample as a candidate for injectable hydrogel as the treatment of OA. The fabrication of HA-DOX samples using the freeze-thawing method succeed to conduct hydrogel, and the fabrication of the hydrogel films using the drying method. The HA sample is showed clear gel looks like appearance. HA-DOX samples were slightly yellowed. FTIR result is showed that each sample represent the functional group of hyaluronic acid and doxycycline such as N-H, C-H, C=O, CH2 bending, CH3 bending. The SEM results were showed that the smooth surface of the samples, well interface. The tensile strength results were showed in sample without DOX had lower tensile strength compared with hydrogel sample with DOX and Zn2+ ions. The injectability test on HA only and HA-DOX samples showed good results, such as A) 94.07%, B) 97.69%, C) 95.78%, and D) 94.97%. Based on the results of the cytotoxicity test, all samples were showed good result of viability cell percentage. HA only (A) sample was 83.93%, while others 3 HA-DOX samples were also showed good percentage of viable cell, which were 73.74%; 72.46%; and 70.29% subsequently. It can be concluded due to the tensile strength test, SEM test, cytotoxicity test and injectability test, that the HA-DOX sample with 0.71 mg DOX variation (B sample) was the best sample as a candidate for injectable hydrogel as a joint bearing for osteoarthritis cases.

Keywords: Hyaluronic Acid; Doxycycline; injectable hydrogel, Osteoarthritis (OA)

ID – 34

Slowing Down Energy and Food Crises with Agricultural Waste: Briquetting for Enhancing Plant Growth and Energy Harvest

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Abstract. The demand for sustainable food and energy has become increasingly urgent. The 2030 sustainable development goals (SDGs) are not making progress as quickly as needed, and recent price increases in food and energy have highlighted the severity of the crises. Developing countries, with limited resources and difficulty in feeding their populations, have been hit especially hard. A fast solution is urgently needed to address this issue. Our research proposes a solution for enhancing energy security in household communities and small industries by utilizing charcoal bio-briquettes made from agricultural waste such as rice husk and corn cob. We utilized charcoal retort tube systems to carbonize waste materials and a hydraulic briquetting machine to press the briquettes, resulting in prototype cylinder briquettes. We have analyzed the moisture content, ash content, caloric values, and stability. Our results showed that such a transformation model approach is a suitable solution for action in both energy and food sustainability. Through the discussion process, we have concluded that the act could be a suitable model for biophysical economic recovery model for disasters like COVID-19. While also reducing waste and increasing the efficiency of land production for food and energy. However, more research is required for a complete model.

Keywords: Agricultural Waste, Bio-briquettes, Energy-food, Environmental Sustainability

ID – 35

The Analysis of Semeru Volcanic Ash Erupted in December 2021 on the Growth of Legumes (Mungbean and Soybean) and Its Effect on the Resilience of People

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Abstract. The 2021 eruption of Mount Semeru in East Java has released volcanic ash that poses a threat for both human wellbeing and soil. As volcanic eruption is not uncommon in East Java, people have become accustomed to them, making them more resilient. However, each event is unique so it's important to investigate them from various perspectives through transdisciplinary or multidisciplinary research. Volcanic eruptions can serve as a model for sudden climate change, teaching people how to adapt, mitigate, and become more resilient. Our research explores the potential use of Semeru volcanic ash (SVA) as a fertilizer for growing soybean and mung bean, two legumes in high demand due to the recent COVID-19 pandemic in the surrounding area. We tested five different SVA compositions mixed with soil and compared them to a control group without any SVA added. The growth of seedlings was observed for characteristics such as height, number of leaves, wet and dry mass, pH, electrical conductivity, and element content including C, N, P, K, Mg, Fe, and Si. Our results showed that SVA contains 0.25% C and 0.46% N, while P and K were approximately in ppm and 402.4 ppm respectively. SVA also contains Mg, Fe, and Si at around 784.3 ppm, 1.37%, and 74.05%, respectively. We concluded that volcanic ash properties vary depending on the source and there is a need for further investigation of volcanic eruptions in a transdisciplinary or multidisciplinary manner.

Keywords: Resilient, Growth, Semeru-Volcanic-ash, Biophysics, Legumes

ID – 36

Fiber Optic Acoustic Sensor for the Measurement of Amplitude and Frequency of Sound Signals with SMS Structure

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Abstract. This work presents a comprehensive analysis of the operational principles, design considerations, experimental procedures, and performance evaluation of an intrinsic fiber optic acoustic sensor with step index SMS structure. The sensor is specifically designed to accurately monitor both the amplitude and frequency of sound signals. The device consists of optical light source, fiber optic structure Singlemode-Multimode-Singlemode (SMS) with multimode 45 mm length, audio generator, output acoustical signal, oscilloscope, and optical power meter. The SMS sensor can measure acoustical amplitude ranging from -51.30 to -82.55 dB Within frequency range 30 to 180 Hz. The sensitivity of the device is found to be 0.94995 ± 0.014. Inherent optical fiber sensors have several advantages, including their lightweight nature, immunity to electromagnetic interference, and absence of power in the sensing component.

Keywords: Singlemode-Multimode-Singlemode, Multimode Interference, Acousto-optical, Intrinsic fiber sensor, Multimode step index

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Analysis of Calf Muscle Contractions in Various Foot Positions Using Accelerometer Sensor on a Mobile Phone

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Abstract. The calf muscle functions as the body's second heart, playing a vital role in pumping venous blood back to the heart. It contributes to effective blood circulation through active contractions and relaxation. This research aims to detect and compare the magnitude of calf muscle contractions in the lower limb in 12 different foot positions. Measurements are conducted using an accelerometer sensor installed on a mobile phone. The first phone is placed adjacent to the lower limb, next to the calf muscle, while the second phone is positioned at the heel. The accelerometer sensor is utilized to monitor calf muscle contraction activities concurrently with changes in foot posture. Accelerometer data consists of contraction signals that undergo normalization, filtering, feature extraction, and segmentation. Data analysis was based on calculating the amplitude of dominant calf muscle contractions in each leg posture, with predetermined thresholds to identify significant muscle contractions. The research findings identify effective foot postures for calf muscle training with an amplitude value range of 0.6-0.9, particularly in exercises 2, 6, and 8. These discoveries can make a significant contribution to enhancing calf muscle strength and function, as well as providing a deeper understanding of the relationship between foot posture and calf muscle contraction activities.

Keywords: Accelerometer, Calf muscle, Contraction, Foot Posture

ID – 38

The E-Nose Technology for Catfish Identification Based on Aquaculture Environments

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Abstract. Catfish is a commercial freshwater fish species. Hence, they are extensively farmed. The meat of the catfish is tasty and quite nutritious. Catfish is fast-growing and able to thrive in subpar conditions. This means that bacteria can quickly spread in catfish. *Escherichia coli* is a bacterium frequently found in contaminated water and soil. Contamination of food with *Escherichia coli* can increase human health risk. Therefore, this study aims to use an electronic nose to identify contaminated catfish with *Escherichia coli*. Catfish from both farm and wild settings, as well as *Escherichia coli*-contaminated catfish, were included in the research samples. Each sample's odor is picked up by the electronic nose and processed using Principal Component Analysis (PCA). The result shows PCA successfully classified catfish into three classes: farmed, wild, and contaminated with *Escherichia coli*, with 75.8% accuracy. Based on this, the electronic nose is a promising candidate for detecting and identifying *Escherichia coli* contamination in food ingredients.

Keywords: E-Nose, Catfish, Health risk, *Escherichia coli*

ID – 39

Study of Metamaterial as Controlling Electromagnetic Wave Material

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Abstract. Metamaterial is an artificial material that tailors its electromagnetic properties. It can control the electromagnetic response by tailoring its electromagnetic properties such as permittivity and permeability. The periodic metallic structure on the dielectric as the unit cell is the key parameter to tailoring electromagnetic properties. The specific design of the unit cell can yield the polarization and magnetization phenomena; thus, the permittivity and permeability of materials can be adjusted. The metamaterial can be applied to the sensor, stealth technology, and perfect lens by controlling its properties. We present our summary works about the study of metamaterial. We have studied metamaterial for sensors, high absorbance, high refractive index, and negative refractive index.

Keywords: Electromagnetic wave, Metamaterial, Permeability, Permittivity

ID – 40

The Effect of Titanium Oxide (TiO_2) Addition on Improving the Performance of Zinc Oxide Nanoparticles (ZnO-NPs) as a Sunscreen Formulation

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Abstract. Sunscreen is a cosmetic that can provide protection to the skin from sunlight. One example of materials commonly used in sunscreens are zinc oxide nanoparticles (ZnO-NPs) and titanium dioxide (TiO_2), which work by reflecting ultraviolet light from the skin. The purpose of this study was to determine the effect of the addition of TiO_2 to ZnO nanoparticles as a sunscreen preparation and to determine the most optimum concentration variation of TiO_2 and ZnO nanoparticles as a sunscreen preparation. The samples in this study were made in cream preparation which then added zinc oxide nanoparticles and titanium dioxide to make a sunscreen preparation. Variations in the ratio of ZnO nanoparticles and TiO2 used in this study are 1:0.5; 1:0.75; 1:1; and 1:1.5. In this study, two controls were also used, namely ZnO and TiO_2 nanoparticle sunscreen preparations. Based on the Particle Size Analyzer (PSA) test, the ZnO nanoparticles used have a particle size of 46,64±9,5 nm while TiO_2 has a particle size of 164,7±71,77 nm. Both materials were then added to the sunscreen preparation formulation and characterized. The UV-Vis spectrophotometer test results prove that all samples provide protection against ultraviolet, where the highest absorption is at UV-A wavelengths between 320-400 nm. In calculating the SPF value, the sample with a ratio of 1:0.75 has the highest SPF value of 24.8 ± 0.12. From the research conducted, it can be concluded that the addition of titanium dioxide affects the SPF value of zinc oxide nanoparticle sunscreen preparations. The combination of the two materials provides balanced protection between UV-A and UV-B. In addition, the particle size of ZnO and TiO_2 nanoparticles also affects the increase in SPF value, where the smaller the particle size, the more surface area that rubs, so the stronger the absorption of ultraviolet rays.

Keywords: Zinc Oxide Nanoparticle, Titanium Dioxide, Sunscreen preparation

ID – 41

Polycaprolactone-Polyaniline Alloy in 3D Printing Scaffold as Bone Implant

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Abstract. Bone is one of the body's crucial organs because it serves as a structural support and protects important organs in the body. Electroactive scaffolds are one of the latest generations of intelligent biomaterials that are very interesting for handling these cases because they can increase cell growth and bone tissue regeneration processes. This study aims to characterize the effect of Polyaniline (PANI) concentration on Polycaprolactone (PCL) based scaffolds. Synthesis of Polyaniline emeraldine salt by direct chemical oxidation method. This study show that PCL-PANI 0.1% scaffold can be used as a bone scaffold candidate.

Keywords: Bone Implant**,** 3D Printing**,** Polycaprolactone**,** Polyaniline

ID – 42

Computer Vision with Convolutional Neural Network for Product Inspection with Edge Impulse Studio and ESP32-Cam Microcontroller

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Abstract. This paper presents a comprehensive approach to product inspection using Computer Vision and Convolutional Neural Networks (CNN) in conjunction with Edge Impulse Studio and the ESP32-Cam microcontroller. Quality control and defect detection in manufacturing processes are critical for ensuring product reliability and customer satisfaction. In this study, by leveraging the capabilities of the ESP32-Cam, a low-cost and energy-efficient microcontroller with an integrated camera module, is developed a cost-effective and versatile product inspection system. The methodology begins with the collection of a diverse dataset of product images, including both defect-free and defective items, which is subsequently processed using Edge Impulse Studio. It is employed by the platform's intuitive interface for data preprocessing, feature extraction, and model training. A custom CNN architecture is designed and fine-tuned for the specific product inspection task. The trained model is then deployed on the ESP32-Cam to perform real-time inference. Results demonstrate the effectiveness of the approach in accurately identifying defects and anomalies in manufactured products. The CNN model achieved an impressive classification accuracy and precision over 80% on the testing, showcasing its robustness in distinguishing between good and defective items. Furthermore, the integration of Edge Impulse Studio and the ESP32-Cam provides a seamless and efficient solution for deploying computer vision systems in resource-constrained environments. In conclusion, this research highlights the potential of combining Edge Impulse Studio with the ESP32-Cam for computer vision-based product inspection. The system's accuracy and real-time capabilities make it a valuable tool for manufacturers aiming to enhance quality control processes while minimizing costs. Future work may focus on extending the system's capabilities to support a broader range of inspection tasks and integrating it into industrial automation setups.

Keywords: Computer Vision, Convolutional Neural Network, Edge Impulse Studio, ESP32-Cam, Product Inspection

ID – 43

Effect of ZnO Sputtering Time as Photoanode ITO-PEN/TiO_2/ZnO on Microstructure and Optical Properties for Flexible DSSC

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Abstract. The development of renewable energy sources is urgently needed to reduce the use of fossil fuels globally, so renewable energy devices are needed to produce electricity supplies. The Flexible DSSC System photoanode (ITOPEN/TiO_2/ZnO-D205) was developed as a photovoltaic device to produce high enough electrical energy and is flexible it is easy to apply compared to other DSSC systems. TiO_2/ZnO layer is deposited using the sputtering method with varying sputtering times of 0, 30 and 60 minutes which will give rise to different characteristics. The structural characterization and optical properties were tested using XRD and UV-Vis. The analysis results show that increasing the sputtering time causes a high XRD peak which then reduces the crystal size, increases the crystallinity, and the energy band gap decreases. The highest sample absorbance maximum value was recorded at 60 minutes, in the wavelength range of 405 nm with a band gap energy of 3.08 eV, and a crystal size of 16.31 nm and crystallinity of 43.9%. Thus, the novelty of the Flexible DSSC device with photoanode (ITO-PEN/TiO_2/ZnO-D205) has the potential to sustain research on renewable energy sources in the field of integrated solar cells.

Keywords: TiO_2, ZnO, Sputtering, Flexible DSSC

ID – 45

A Comprehensive Study of Iron Ores from the Area Around Kupang, East Nusa Tenggara

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Abstract. This study was conducted within the Kupang region (comprising both regency and city areas) with the primary objective of examining the composition and microstructure of iron ore found in this locality. Samples of iron ore, in the form of sand, were gathered from five distinct locations: Sumlili, Takari, Tarus, Kelapa Tinggi, and Sulamanda. The iron ore was separated from the sand using a magnetic separation technique. The samples were then characterized through X-ray Fluorescence (XRF) analysis, X-ray Diffraction (XRD) analysis, and observed using a Scanning Electron Microscope (SEM). The XRF analysis outcomes revealed that the iron (Fe) content was most pronounced in Sumlili (69.1%), followed by Kelapa Tinggi (65.16%) and Sulamanda (61.35%). The XRD analysis indicated that Magnetite was the predominant iron crystal phase across all samples. Furthermore, the SEM analysis identified a range of particle structures with sizes varying between 20 and 40 μm.

Keywords: Iron ores, X-Ray Diffraction, X-Ray Fluoresence, Magnetite, Kupang

ID – 46

Crystalline phase from XRD Spectrum of Kolbano Sand: a Profex Based Study

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Abstract. This study aimed to characterize the crystal structure, crystallite size, microstrain, and crystal phase composition of Kolbano sand using X-Ray Diffraction (XRD) data with Profex software (Rietveld refinement method). The sand sample contained three types of crystal phase minerals: Calcite, Quartz, and Ankerite. The crystal structure differed from the XRD database, indicating a modified structure effect from microstrain of 10-3. The crystallite size was 872 nm for Calcite, 3612 nm for Quartz, and 234 nm for Ankerite. The composition (%wt) was 70.35 for Calcite, 26.52 for Quartz, and 3.13 for Ankerite. The sand sample also had high Calcium (Ca) content, which was different from a previous study that had high Silicon (Si) content. This due to the different location of data sampling. The results reveal the unique characteristics of the sand sample, such as the modified crystal structure, the microstrain effect, and the high Ca content, which distinguish it from other sand sources.

Keywords: Crystal phase, XRD, Kolbano sand, Calcite

ID – 47

Antibacterial Effect of Silver Nanoparticles Synthesized by Grape Seed Extract Against *Staphylococcus aureus* and *Escherichia coli*

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Abstract. Worldwide, infectious diseases present a serious health concern. Microorganisms like bacteria, fungus, and viruses are frequently present in the environment of living organisms, most notably humans. Grape seed extract (GSE) is a natural source of polyphenolic compounds and secondary metabolites, which have been tested for their possible antimicrobial activities. In the current study, we tested the antibacterial and antifungal activities of aqueous GSE and the biosynthesized silver nanoparticles loaded with GSE (GSE-AgNPs) to mitigate the presence of gram-negative bacteria, such as Escherichia coli, and gram-positive bacteria, including *Staphylococcus aureus*, both of which have the potential to cause infections. The method employed involved bacteria with the addition of GSE-AgNPs at concentrations of 1 mM, 1.5 mM, and 2 mM. Total Plate Count (TPC) was used to assess the reduction in bacterial viability, measured in CFU/ml. The results indicated that the addition of 10 µl of AgNPs-GSE, with a wavelength of 405 nm and an energy density of 3.44 J/cm², had the potential to photoinactivate *Escherichia coli* and *Staphylococcus aureus* bacteria. The findings from the present study indicate that at this energy density, it was possible to inactivate *Escherichia coli* by 87.60% and *Staphylococcus aureus* by 91.60%.

Keywords: Silver nanoparticles, grape seed extract, green synthesis, antibacterial

ID – 48

Intensifying The Characteristics and Performance of Hydrophobic Zeolite Produced from Bamboo Leaves for Bioethanol Purification

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Abstract. The limited availability of petroleum as an energy source is the reason for the emergence of research related to the development of renewable energy. Research related to the use of bioethanol with a purity of 99.5% as a biofuel substitute has been widely carried out. However, in previous research, bioethanol production was not carried out efficiently and energy saving. The purification process through distillation has many limitations. The aim of this research is to produce hydrophobic zeolite made from bamboo leaves as an adsorbent in the bioethanol adsorption process and to determine the effect of Si/Al composition, zeolite weight, and residence time on the bioethanol adsorption. The methods used include bamboo leaf preparation, hydrophobic zeolite production, SEM, EDX, and FTIR characterizations, and adsorption performance testing. The SEM results show the zeolite has small pores with a uniform distribution of crystals. The EDX and FTIR analysis of zeolite with Si/Al ratios of 15:1, 20:1, and 25:1 has a silica content between 5.67 - 21.80% mass, and there are Si-O-Si and Si-O-Al functional groups as carriers of hydrophobic properties. Based on performance tests, the zeolite obtained has a high bioethanol adsorption capacity with a final bioethanol refractive index value of 4 - 5% brix. Hydrophobic zeolite from bamboo leaves is an advanced material that is promising as an efficient adsorbent for purifying raw bioethanol into fuel-grade bioethanol. Application on a commercial scale can greatly reduce energy consumption during the distillation process.

Keywords: Adsorbent, Advanced material, Bamboo Leaves, Bioethanol, Hydrophobic

ID – 49

Characteristics of Rice Husk Briquettes with Taro Starch Adhesive (*Colocasia esculenta L.*)

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Abstract. Rice husk briquettes have great potential to be developed as an alternative energy source. The characteristics of briquettes are divided into physical characteristics and chemical characteristics. In the process of making briquettes, an adhesive is needed. Taro has a high starch content, ranging from 70-80%. Therefore, taro starch can be used as an alternative to briquette adhesive. The purpose of this study was to analyze the quality of rice husk briquettes for the variation of the adhesive and to analyze the effect of variations in the amount of adhesive on the calorific value of the briquettes. In this research, an analysis of the physical characteristics of the briquettes (ash content, moisture content, volatile matter, and fixed carbon) and the chemical characteristics of the briquettes (calorific value) was carried out. The results of the study showed that the characteristics of the briquettes met the SNI quality standards for water content, fixed carbon, and ash content for briquettes with taro starch adhesive concentrations of 5% and 10%, but did not meet the SNI quality standards for volatile matter, calorific value, and ash content with an adhesive concentration of 15%. Briquettes with a 5% adhesive percentage have a highest calorific value of 4245.7 Cal/g but do not exceed SNI quality criteria.

Keywords: Rice Husk, Briquettes, Taro Starch Adhesive, Characteristics of Briquettes

ID – 50

Utilization of DAQ module and Accelerometer Sensors for Horizontal to Vertical Spectral Ratio (HVSR) Analysis

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Abstract. The horizontal-to-vertical spectral ratio (HVSR) is one of the geophysical methods to analyze ground motion. It measures the motion amplitude in three directions (two horizontal and one vertical). Then, the signal from the horizontal (side-to-side) direction, compared to the vertical component, varies with frequency. In this paper, the authors want to develop a system implementing three-component accelerometers as ground motion sensors and a data acquisition module (DAQ) for the analog-to-digital converter. Because of the multiplexing method in the DAQ, the authors apply 1 kHz for the sampling rate. The measured data from a DAQ is presented on the display computer and saved in the computer drive. The output system is compared to a commercial one to preview its reliability. Accordingly, their results are similar; hence, the developed system can be occupied for its intended purpose.

Keywords: DAQ, accelerometer, ground motion, HVSR

ID – 51

Enhancing the Physical and Mechanical Properties of Ply-Bamboo: The Impact of Steam Pre-Treatment on Black Bamboo Strips

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Abstract. Bamboo offers a promising alternative to wood, owing to its plentiful supply and advantageous mechanical attributes. However, its compact dimensions and high content of hemicellulose and extractive substances pose challenges in terms of high hygroscopicity and susceptibility to deteriorative factors, necessitating its transformation into ply-bamboo composites. Previous research has demonstrated the efficacy of steam treatment in improving ply-bamboo's physical and mechanical properties though elevated temperatures might weaken the bamboo's innate strength. Therefore, a deeper exploration into the effects of a modified steam treatment protocol on ply-bamboo's properties is justified. The current study uses black bamboo (*Gigantochloa atroviolacea*), subjecting it to steam treatment at 126°C for varied durations (30, 45, and 60 minutes). The subsequent ply-bamboo, with dimensions of 30 × 30 × 1.5 cm³, was tested for specific properties in line with ASTM D 143:2014 and JAS 234:2003. These included physical properties like moisture content, density, thickness swelling, water absorption, and delamination, as well as mechanical attributes, such as the modulus of rupture and modulus of elasticity. The findings of this study underscore the considerable enhancement of ply-bamboo's physical and mechanical features upon undergoing steam treatment at 126°C.

Keywords: Bamboo, Black Bamboo, Physical And Mechanical Properties, Ply-Bamboo, Steam Treatment

ID – 52

Bacterial cellulose production from banana peel waste with ethanol addition

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Abstract. Banana peel is waste from banana processing industry which has the potential to produce fermented products. This research investigated the production of bacterial cellulose from banana peel waste with the addition of ethanol. The highest production of bacterial cellulose or nata was obtained during 14 days of fermentation. Nata produced without the addition of ethanol with 7 days of fermentation produced 5.06% of yield, 94 grams of wet weight, 76 grams of dry weight, and 19.15% of moisture content. As for 14 days fermentation produced 6.86% of yield, 132.4 grams of wet weight, 102.9 grams of dry weight, and 22.28% of moisture content. The result showed that longer fermentation time produced higher yield, wet and dry weight, and water content. The addition of 1% ethanol in nata medium can inhibit the growth of *Acetobacter xylinum* so that nata cannot be formed.

Keywords: Bacterial Cellulose, Banana Peel, Ethanol

ID – 53

Characteristics Test of Mechanical Properties and Biodegradation of Bioplastic Banana Kepok Peel Starch and Polyvinyl Alcohol Based on Reinforcement Corn Husk Cellulose

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Abstract. The use of synthetic plastic can cause a buildup of plastic waste which is a problem for the environment because it is difficult to decompose. Therefore, a solution is needed to overcome this problem by developing bioplastics made from starch and Polyvinyl Alcohol (PVA). Bioplastics from starch and PVA have weaknesses in their mechanical properties so that reinforcement is needed in the form of cellulose which is extracted using the 5% NaOH alkalization method. This research aims to analyze the mechanical properties and biodegradation of bioplastics with variations in the addition of cellulose concentration. This research used kepok banana peel starch, PVA, and corn husk cellulose. Making bioplastics using 3 g of starch and PVA by adding variations of cellulose at a concentration of 0; 2; 4; and 6% of the weight of dry starch and 2 mL of glycerol plasticizer. Determination of the mechanical properties of bioplastics was carried out by testing tensile strength using a Universal Testing Machine based on ASTM D-882 standards. The best mechanical properties test results were found in bioplastics with the addition of a cellulose concentration of 6% with tensile strength values of 1.67 ± 0.12 MPa, strain of 35.75 ± 1.74%, and Young's Modulus of 4.5 ± 0. 15 MPa, while the largest percentage of degradation was found in bioplastics without the addition of cellulose, namely 29.27% on the 9th day.

Keywords: Biodegradable, Bioplastics, Corn Husk Cellulose, Kepok Banana Peel Starch, PVA

ID – 54

Smart Comfort: IoT Implementation in Classroom Comfort, E204, ITERA (Case Study)

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Abstract. To support student productivity in the room, a thermal and visual comfort monitoring tool is needed that can tell the state of the classroom. The purpose of this research is to design Smart Comfort as a tool that can function in thermal and lighting measurements in E204 ITERA classrooms, determine the accuracy of Smart Comfort in thermal and lighting monitoring, determine the large range of lighting and thermal monitored by Smart Comfort in the classroom at 09:00 WIB, and test the suitability of thermal and lighting measurement results in E204 ITERA classrooms with SNI 03-6572-2001 and SNI 03-6575-2001. Smart Comfort consists of ESP32, ESP32-Cam, DHT11 sensor, LDR sensor, relay, lamp, and fan integrated as IoT through Firebase database and application. The device is designed using calibrated sensors with DHT11 accuracy of 94.21% for relative humidity and 97.12% for temperature with an average confidence interval (α=5%) of 69.8±0.392% for relative humidity and 29.98±0.206°C for temperature. The accuracy of the LDR sensor is in the range of 97.34% - 99.98% with the largest confidence interval (α = 5%) being 128.3 ± 0 lux. The results of monitoring relative humidity and temperature are categorized as comfortable warm in accordance with the comfortable category of SNI 03-6572-2001. The results of light intensity monitoring are in the range of 100 - 1221 lux or fluctuating high, which means that the light intensity is not in accordance with the comfortable category of SNI 03-6575-2001.

Keywords: Comfort, classroom, IoT, Smart Comfort, ESP32

ID – 55

Inter-Layered Interaction of the Polymeric HCOOH: a Density Functional Studies

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Abstract. Polymeric formic acid is a type of formic acid that undergoes polymerization under high pressure, resulting in the formation of a polymeric phase. Formic acid is the simplest carboxylic acid and has a wide range of potential applications in various fields, including energy storage and catalysis. Previous studies have reported that the adsorption of formic acid on clean surfaces leads to the formation of polymeric adlayers. Furthermore, previous studies also reported the importance of the interchain and intrachain between the polymeric formic acid. However, the inter-layered interaction of polymeric formic acid was not yet fully understood. In this study, we investigated the interaction between polymeric formic acid using density functional theory (DFT). It is found that the inter-layered formic acid stabilizes the polymeric formic acid. Furthermore, we also investigated the interaction energy between the polymeric formic acid layer.

Keywords: Density Functional Theory, Inter-Layered, Polymeric Formic Acid

ID – 56

Thermal Analysis on Heatsink with Variation of 5 Materials Using ANSYS CFD Simulation

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Abstract. A heatsink is a component specifically designed to dissipate heat from electronic components, such as processors, and the size of the heatsink is one of the key factors affecting cooling efficiency. This research evaluates the thermal performance of a heatsink by applying five different materials and making changes in the heatsink dimensions compared to previous studies. Simulations were conducted using Computational Fluid Dynamics (CFD) software ANSYS. The results of this analysis provide insights into the influence of materials on the thermal performance of the heatsink, aiding in the selection of suitable materials for specific applications and potentially improving the efficiency of electronic devices relying on heatsinks for cooling. The materials used were aluminum, copper, iron, stainless steel, and diamond, with heatsink dimensions of 50×50×20 mm to analyze temperature distribution and thermal efficiency at 25°C, 125°C, and 225°C. Among the materials tested in this thermal analysis, diamond exhibited the highest values in heat distribution based on Total Heat Flux, with stable values across all three temperature tests, reaching 242. The lowest value was obtained for stainless steel at 227. Directional heat flux and total heat flux values showed a linear relationship. If the correlation value obtained is positive, directional heat flux and total heat flux remain stable.

Keywords: ANSYS, CFD, Heatsink, Simluation and Thermal

ID – 57

Calibration of Sound Processing in BATTLE ROYALE Game Sound Effect and It's Influences on Player's Perception of Direction (Case Study: Player Unknown Battle Ground Mobile)

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Abstract. The audio component of video games is required to collect information about the opponent's position and equipment via dialogue and binaural analysis. Audio in game can be statistically processed utilizing binaural engineering approaches, specifically Interaural Time Difference and Interaural Amplitude Difference. The intensity of gunshots and footsteps was measured to acquire quantitative data. Measurement using RTA (Real Time Analyzer) were taken at various angles (0°, 30°, 45°, 60°, 90°). According to measurement, the difference in sound intensity for gunshot was was 0.23 dB, 2.26 dB, 3.26 dB, 4.19 dB, and 5.94 dB. On the other hand, the difference in sound intensity was determined for the sound of footsteps at 0.29 dB, 1 dB, 1.63 dB, 2.12 dB, and 4.49 dB. Questionnaires were provided to a total of 53 respondents in order to collect qualitative data. It was discovered through the distribution of questionnaires that audio aids players' perception in estimating the direction of the enemy's approach. However, there is no discernible difference between one film and another since the Interaural Time Difference and Interaural Amplitude Difference values are extremely small, rendering the human ear unable of distinguishing between them.

Keywords: Binaural, Game, Interaural Amplitude Difference, Interaural Time Difference

ID – 58

Green Synthesis of Silver Nanoparticles with Green Tea (*Camellia sinensis*) Extract Bioreductant and Antibacterial Activity Test Against *Escherichia Coli* and *Staphylococcus Aureus* Bacteria

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Abstract. Green tea is known to have antibacterial benefits, and silver nanoparticles have been widely used in biomedical devices because of their antibacterial, antifungal, and antiviral properties. This research aims to determine the potential of blue laser and adding AgNPs-CS to reduce gram-negative *Escherichia coli* and gram-positive bacteria *Staphylococcus aureus*, which can cause infections. The materials used in this research are natural ingredients in the form of green tea extract (*Camellia sinensis*). Manufacturing (AgNPs-CS) was carried out using the green synthesis method using silver nanoparticles (AgNPs/$AgNO_3$). This research involved varying concentrations of 1 mM, 1.5 mM, and 2 mM silver nanoparticles. The silver nanoparticles were then heated in a microwave at 135 watts for 30 minutes until the color changed to brownish yellow. Characterization uses UV-Vis spectrophotometry and Particle Size Analyzer (PSA). Irradiation time using a blue laser for 90, 120, 150, and 180 seconds. The results were analyzed using the Two Way-Anova Factorial statistical test and Tukey's Post Hoc test with $p < 0.05$. *Camellia sinensis* silver nanoparticles 2 mM can increase the percentage of death of gram-negative bacteria (*Escherichia coli*), which amounted to 78.71 %, and gram-positive (*Staphylococcus aureus*) amounting to 79.71 %. In treatment without AgNPS-CS, the death of *Escherichia coli* bacteria was 70.15%, and *Staphylococcus aureus* was 76.07% with irradiation for 180 seconds. *Escherichia coli* bacteria were irradiated for 180 seconds with the addition of AgNPs-CS 1 mM, 1.5 mM, and 2 mM, respectively; there was a reduction in bacterial death by 62.16%, 69.27%, and 79.01%. Meanwhile, *Staphylococcus aureus* was 57.70%, 80.76% and 89.74%. At an energy density of 3.44 J/cm^2, it can inactivate *Escherichia coli* by 79.01% and *Staphylococcus aureus* by 89.74%.

Keywords: Green Tea (*Camellia sinensis*), Photoinactivation, Photosensitiser, Blue Laser, *Escherichia coli*, *Staphylococcus aureus*

ID – 59

The Effect of Differences in Intercritical Annealing Temperatures on the Microstructure, Hardness and Tensile Strength of AISI 1020 Steel

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Abstract. The purpose of this study was to determine the effect of variations in intercritical annealing temperature on the material characteristics of AISI 1020 steel. The heat treatment process was carried out in a furnace with temperature variations of 673℃, 723℃, 773℃, 823℃, and 873℃. Cooling process with new oil medium SAE 20W-50. The testing process carried out is the microstructure test, hardness and tensile test. The microstructure test results obtained on RAW material and intercritical annealing at temperatures of 673℃ to 773℃ contained ferrite and pearlite phases, while at temperatures of 823℃ and 873℃ there were phases namely ferrite and pearlite, but there was Asicular ferrite. The result of the hardness value on RAW material is 189.66 HBN, and the highest increase in hardness occurs at a temperature of 873℃ with a value of 181.89 HBN. The result of the tensile strength of RAW material is 207.3 MPa and after the intercritical annealing process the highest tensile strength value is at 873 ℃ which is 205.55 MPa. Then for the increased length of the RAW material it is 5.62% and there is an increase at a temperature of 873℃ with a yield of 8.84%. The result of this research is the increased ductility of AISI 1020 steel.

Keywords: AISI 1020, Intercritical annealing, SAE20W-50, Tensile

ID – 60

Green Synthesis Silver Nanoparticle – *Senna Alexandrina* (AGNPS-SA) Effect to *Staphylococcus aureus* Bacteria

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Abstract. Humans are susceptible to infection by microorganisms. The diseases caused by bacteria become more severe as it develop more resistance to antibiotics. To overcome this, researchers sought new methods to develop more effective antimicrobials. In this research, Chinese teak leaves (*Senna Alexandrina*) were used in powder form to make nanoparticles. 1 gram of Chinese teak leaves is mixed with 100 ml of water using a magnetic stirrer. After homogenization, the silver nanoparticles - *Senna Alexandrina* (AgNPs-SA) were carried out using the green synthesis method using 100 ml of silver nanoparticles (AgNPs). If nanoparticles in the form of AgNPs-SA have been formed, the sample is tested for ultraviolet visible (UV-Vis) to see the absorbance value of the sample. The synthesis results obtained showed the stability of particle size based on color and absorbance. The UV-Vis spectrum shows a stable absorbance peak at 430 nm, with nanoparticle sizes ranging from 123-129nm. To test the antimicrobial effect, the sample was tested for *Staphylococcus aureus* bacteria. The bacteria were cultured and antibacterial tests were carried out using the agar-disk diffusion method and antimicrobial photodynamic therapy (aPDT) using a blue laser to see the effect of samples when exposed to laser light for 15, 30 and 45 seconds accompanied with different concentrations of AgNPs-SA at 0 mM, 1 mM, 1.5 mM, and 2 mM. The antibacterial properties of AgNPs-SA exhibited remarkable efficacy where the *S. aureus* bacteria culture showed an increase in inhibition area when diffused with AgNPs-SA. When aPDT method was performed, it was found that there was a statistically significant interaction between AgNPs-SA concentration and aPDT exposure time on the number of bacterial cultures ($p<0.005$). These findings indicate that aPDT treatment accompanied by AgNPs-SA can significantly impact the number of bacteria in the sample by increasing the exposure duration and the nanomaterial concentration.

Keywords: Green Synthesis, Nanomaterial, *Senna Alexandrina*, Antimicrobial

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Effect of Green Synthesis Silver Nanoparticle – *Senna Alexandrina* (AGNPS-SA) to *Escherichia Coli* Bacteria

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Abstract. Climate change has a negative impact on human health because humans are very susceptible to bacterial or viral infections. The diseases caused by bacteria become more severe as it develops more resistance to antibiotics. To overcome this, a lot of research is being carried out to find alternative methods to develop more effective antimicrobials. In this research, Chinese teak leaves (*Senna Alexandrina*) powder was used to make nanoparticles using green synthesis method. magnetic stirrer was used to mix 1 gram of Chinese teak leaves with 100 ml of water. After the solution became homogenous, the silver nanoparticles-*Senna Alexandrina* (AgNPs-SA) was carried out using the green synthesis method using 100 ml of silver nanoparticles (AgNPs). If nanoparticles in the form of AgNPs-SA have been formed, the sample is tested for ultraviolet visible (UV-Vis) to see the absorbance value of the sample. The synthesis results obtained showed the stability of particle size based on color and absorbance. The UV-Vis spectrum shows a stable absorbance peak at 430 nm, with nanoparticle sizes ranging from 123-129nm. To test the antimicrobial effect, the sample was tested for *Escherichia coli* bacteria. The bacteria were cultured and antibacterial tests were carried out using the agar-disk diffusion method and antimicrobial photodynamic therapy (aPDT) using a blue laser to see the effect of samples when exposed to laser light for 15, 30 and 45 seconds accompanied with different concentrations of AgNPs-SA at 0 mM, 1 mM, 1.5 mM, and 2 mM. The antibacterial properties of AgNPs-SA were proven to be very good where *E. coli* bacteria culture showed an increase in inhibition area when diffused with AgNPs-SA. When aPDT method was performed, it was found that there was a statistically significant interaction between AgNPs-SA concentration and aPDT exposure time on the number of bacterial culture *E. coli* ($p<0.05$). These findings indicate that aPDT treatment accompanied by AgNPs-SA can significantly impact the number of bacteria in the sample by increasing the exposure duration and the nanomaterial concentration.

Keywords: Green Synthesis, Nanomaterial, *Senna Alexandrina*, Antimicrobial, *Escherichia coli*

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Injectable Alginate/Polypyrrole Hydrogel as Therapeutic Candidate for Spinal Cord Injury

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Abstract. Spinal cord injury (SCI) affects the conduction of motor and sensory signals which causes impaired nerve function. Currently, clinical treatment for SCI cases consists of surgery to decompress the spinal cord, corticosteroids, and rehabilitative treatment, however, this treatment aims to prevent secondary injuries and has not resulted in full functional recovery. Injectable alginate polypyrrole hydrogel is an effective strategy in promoting tissue recovery by bridging lesions with conductivity that helps bioelectrical activity needed by nerve tissue thereby increasing neuron viability and differentiation. Injectable hydrogels were characterized based on functional group, surface morphology, biocompatibility, Ca2+ absorption, viscosity, conductivity, syringeability, and swelling. FTIR functional group test showed pyrrole ring groups confirming the polymerization of polypyrrole and carboxylate functional groups of alginate. SEM morphology observations show pore interconnectivity with a pore size range of 97.72-125.47 μm. Swelling test results showed a swelling ratio of 0.2165-0.4744 corresponding with the application of hydrogel therapy to the central nervous system. Viscosity and syringeability tests carried out to support the application of minimally invasive SCI therapy showed the syringeability percentage was close to 100%. The conductivity test shows that samples are electrically conductive with a conductivity value corresponding to the spinal cord, 10-1 Scm-1. UV-Vis test shows the responsiveness of samples to Ca2+ with a Ca2+ uptake percentage of 49.47-83.18%. The results of the cytotoxicity test showed that samples were non-toxic with cell viability of 86.74-55.09%. Injectable polypyrrole alginate hydrogel has potential as an SCI treatment therapy based on its conductive, Ca^{2+}-responsive, and biocompatible properties that functionally aid spinal cord recovery.

Keywords: Spinal Cord Injury, Injectable Hydrogel, Polypyrrole, Alginate

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Gelatin-Chitosan-Tannic Acid Composite as a Spring-loaded Silo for Gastroschisis Cases

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Abstract. The prevalence of gastroschisis has been on the rise in recent years. Gastroschisis is a congenital anomaly characterized by the protrusion of organs from the abdominal cavity. Managing gastroschisis remains a challenge due to the scarcity of spring-loaded silos. In this research, we developed a composite spring-loaded silo using chitosan, gelatin, and tannic acid with varying concentrations of 0, 0.25, 0.5, 0.75, and 1 (%wt). The composites were fabricated using the solvent casting method. The synthesized composite spring-loaded silo was characterized through tests for transparency, functional group analysis, sample morphology, tensile strength, cytotoxicity, antibacterial properties, contact angle, and skin irritation. The transparency test results indicated that the composite spring-loaded silos were transparent. FTIR analysis revealed the formation of crosslinking between tannic acid and gelatin-chitosan. SEM analysis showed a smooth, homogeneous, and non-porous surface. Cytotoxicity tests demonstrated that the samples were non-toxic, with cell viability ranging from 59.97% to 86.42%. Tensile strength tests revealed that the samples exhibited Young's Modulus and Ultimate Tensile Strength (UTS) values consistent with the human linea alba. Contact angle tests indicated that the samples were hydrophilic, with angles ranging from 58.51° to 63.20°. Antibacterial tests showed that the samples possessed moderate to strong antibacterial properties. Draize skin irritation tests confirmed that the samples did not cause irritation.

Keywords: Chitosan, Gastroschisis, Gelatin, Spring-loaded Silo, Tannic Acid

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Biomaterial-Enhanced Hemostatic Sponge for Non-Compressible Bleeding Control

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Abstract. This study developed and characterized a hemostatic composite sponge composed of chitosan (CS), gelatin (GE), polyvinyl alcohol (PVA), and glycerol (as a crosslinker using a freeze-drying method as a candidate hemostatic agent for irregular wounds. The morphological, hydrophilic, and antibacterial properties of these sponges were tailored by modulating the ratio of PVA to CS. Scanning electron microscopy (SEM) revealed promising pore structures, particularly in the CS1/GE/PVA composite, which exhibited a circular and loose texture and were connected; moreover, they had a surface that appeared more porous, and the CS3/GE/PVA was more distinct and uniform. The CS1/GE/PVA composite had a peak pore size of 75 μm. In turn, the CS3/GE/PVA nanocomposite sponge exhibited a faster average blood-clotting time of 88 ± 23, and hydrophilicity assessments showed that an increased CS concentration led to heightened hydrophilicity, whereas antibacterial evaluations underscored the superior antibacterial activity of the CS3/GE/PVA sponge. The findings of this study suggest the potential of CS3/GE/PVA composite sponges as effective candidate hemostatic agents, particularly for managing noncompressible and irregular wounds.

Keywords: Hemostatic, Chitosan, Polyvinyl Alcohol, Noncompressible Hemorrhage Control, Hemostatic Agent

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Heart Attack Risk Detection using the C5.0 Decision Tree Algorithm

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Abstract. Heart attack is a cardiovascular disease that is often fatal and is one of the main causes of death throughout the world. This disease occurs when blood flow to the heart muscle stops or decreases suddenly, causing damage to the heart muscle tissue. Early detection and rapid treatment of the risk of heart attack is the key to preventing the serious effects of an attack. Decision Tree is a data analysis method used in machine learning and statistics. This is an algorithm that can be used to perform classification or regression on data. Decision Tree works by dividing a dataset into smaller subsets based on a series of decisions or logic rules that are built. The advantages of using the Decision Tree method include ease of interpretation, ability to handle complex data, and does not require complicated pre-processing. However, Decision Tree is prone to overfitting, where the model overfits the training data and cannot generalize well to new data. This research aims to design the Decision Tree C5.0 algorithm to help detect the risk of heart attack. Algorithm performance testing is carried out using secondary data obtained and sorted using eight variables in the design process. The existing data was sorted again using a ratio of 80 to 20 and using 10 k-fold. The results of the sorting are data which is then redesigned using Rstudio. Rstudio's best results are then used as a basis for designing algorithms or services. The best results in Rstudio with the 10 k-fold method produce an average of 95.058%. The algorithm accuracy test results that have been designed are 70.491%.

Keywords: Heart Attack, Risk Detection, C5.0 Decision Tree Algorithm