

LIST OF PROPOSALS

Proposal No.	Project Title
1.	Waste to Wealth: Transforming pectin from agro-waste to value added nutraceuticals with potential application in food and pharma industry
2.	A Sustainable Approach for Treating Industrial Wastewater and Producing Biofuel Using Microalgae by Integrating Indigenous Membrane Technology
3.	Understanding the adsorption behaviour of co-contaminants (heavy metals, antibiotics) on Secondary Microplastics: Assessing its impact on nitrification and bacterial community profiles of Sequencing Batch Reactors
4.	Design and Development of NOMA Based Communication Frameworks for Smart Grids
5.	Enhancement of stress corrosion cracking resistance of Aero-Grade AA7XXX aluminium alloys: Experimental and Machine Learning Approach
6.	Development of FeCoV based High Entropy Alloys for Memory Applications
7.	Experimental and theoretical studies of structure, electronic and magnetic properties of quaternary Heusler alloys

PROPOSAL NO. – 1

Title of the Proposal	Waste to Wealth: Transforming pectin from agro-waste to value added nutraceuticals with potential application in food and pharma industry
Supervisor - I	Dr. Tingirikar Jagan Mohan Rao, <i>Biotechnology</i>
Supervisor - II	Dr. Amarendar Reddy M, <i>DSOS (Chemistry)</i>
E-mail IDs:	tjmr@nitandhra.ac.in , amarendar@nitandhra.ac.in
Abstract	In the present study pectin will be extracted from citrus peel by chemical treatment to produce value added nutraceutical. The resulting nutraceuticals will be subjected to characterization. The above resulting samples will be assessed for their stability to: 1) Prebiotic, 2) Probiotic, and 3) antioxidant properties under <i>in vitro</i> conditions. Based on these experiments the desired nutraceutical compounds can be blended as active ingredient with food and pharm based products to enhance the functional properties. Thus, this project will help us in development of novel nutraceutical compounds from agro-waste produced from Andhra Pradesh.
Keywords	Antioxidant, Prebiotic, Probiotic, Citrus, Nutraceutical
Relevant Publications	<ol style="list-style-type: none">1. Tingirikari JMR. In-vitro prebiotic analysis of microbiota accessible pectic polysaccharides. <i>Curr. Microbiol.</i> (2019) 76:1452–14602. Kumar V, Tingirikari JMR. Degree of methylation: A key to the functional properties of low methylated pectin derived from pectin rich agro waste. <i>Food Biosci.</i> 2023 56:103386.3. David NA, Razan A, Ilanit BSK, Sergei R, AR M, Liraz C. Biopolymers from a bacterial extracellular matrix affect the morphology and structure of calcium carbonate crystals. <i>Cryst. Growth Des.</i> 2018, 18, 9, 5582–5591.
Essential Qualifications required	First class in M.Sc. Chemistry/Biotechnology/allied branch/ M. Tech Biotechnology with GATE/NET
Desirable Qualifications required	First class in M.Sc. Chemistry/Biotechnology/allied branch/ M. Tech Biotechnology with GATE/NET

PROPOSAL NO. – 2

Title of the Proposal	A Sustainable Approach for Treating Industrial Wastewater and Producing Biofuel Using Microalgae by Integrating Indigenous Membrane Technology
Supervisor - I	Dr. Vinoth Kumar Raja , <i>Chemical Engineering</i>
Supervisor - II	Dr. V. Sudarshana Deepa , <i>Biotechnology</i>
E-mail IDs:	sudarshanadeepa@nitandhra.ac.in , vinoth@nitandhra.ac.in
Abstract	The dual challenge of wastewater management and sustainable energy production are critical concerns for the modern world. This proposal presents an innovative approach that concurrently addresses both issues by utilizing microalgae while diligently incorporating membrane technology for biomass harvest. Firstly, viable microalgae <i>Dunaliella salina</i> will be utilized for both wastewater treatment and biodiesel production because of its ability to accumulate a very high quantity of lipids inside its cell by utilizing various industrial wastewater containing organic pollutants as the substrate. Secondly, a microfiltration membrane technology using a low-cost bentonite ceramic membrane will be employed to simultaneously remove organics in the wastewater and recover value-added resources in the form of microbial lipids as an energy-rich product. In addition, lipids accumulated will be extracted and characterized for biofuel production potential. Thirdly, the retention of biomass and lipid yields and the environmental impact will be optimized and assessed, respectively, further demonstrating this approach's sustainability. It will be targeted to provide a promising solution for treating wastewater from the food and beverage industries, paving the way for scalable and greener eco-friendly biofuel production that contributes to the circular economy.
Keywords	Biofuels; Membrane Technology; Microalgae; Wastewater Treatment
Relevant Publications	<ol style="list-style-type: none"> 1. Elangovan B, Detchanamurthy S, Senthil Kumar P, Rajarathinam R, V. Sudarshana Deepa*. Biotreatment of Industrial Wastewater using Microalgae: A Tool for a Sustainable Bioeconomy, <i>Molecular Biotechnology</i>, 11-24, 2023. 2. N.A. Azeez, S.S. Dash, S.N. Gummadi, V. Sudarshana Deepa*, Nano-remediation of toxic heavy metal contamination: Hexavalent chromium [Cr (VI)], <i>Chemosphere</i>, 266, 129204, 2021. 3. S.S. Sringari, Vinoth Kumar Raja*, Treatment of food processing industries wastewater using a novel Fuller's earth clay-based tubular ceramic membrane, <i>Water Science & Technology</i>, 88 (10) (2023), 2533-2546. 4. M.A. Sundaramahalingam, S. Karthikumar, R.S. Kumar, K.J. Samuel, S. Shajahan, V. Sivasubramanian, P. Sivashanmugam, P. Varalakshmi, A. Syed, N. Marraiki, A.M. Elgorban, Vinoth Kumar Raja*, I.G. Moorthy, An intensified approach for transesterification of biodiesel from Annona squamosa seed oil using ultrasound-assisted homogeneous catalysis reaction and its process optimization, <i>Fuel</i>, 291 (2021) 120195.
Essential Qualifications required	As mentioned in the advertisement for interdisciplinary Ph.D. (Full-Time) programme
Desirable Qualifications required	M.Sc. / M.Tech. / M.E. degree in relevant branch.

PROPOSAL NO. – 3

Title of the Proposal	Understanding the adsorption behaviour of co-contaminants (heavy metals, antibiotics) on Secondary Microplastics: Assessing its impact on nitrification and bacterial community profiles of Sequencing Batch Reactors
Supervisor - I	Dr. Baranidharan S, <i>Civil Engineering</i>
Supervisor - II	Dr. Seenivasan A, <i>Biotechnology</i>
E-mail IDs:	baranis@nitandhra.ac.in ayothiraman@nitandhra.ac.in
Abstract	Widespread usage of plastic products in recent years has inevitably resulted in both primary and secondary microplastics in the aquatic environment. MPs possess a unique ability (small size, high hydrophobicity, and large specific surface area) to adsorb a wide variety of pollutants (e.g., heavy metals and organic pollutants) and act as carriers. Considerable effort has been made to identify their presence in aquatic ecosystems, following areas needs more focus: (1) Secondary Microplastics (MPs) adsorption behaviour when co-existing with heavy metals and antibiotics and their impact on microorganisms (2) Leachability Characteristics. MPs fate and behaviour with other contaminants is still a puzzling issue to be understood.
Keywords	Secondary Microplastics, Adsorption, Heavy Metals, Antibiotics, Behaviour
Relevant Publications	<ol style="list-style-type: none"> 1. Sheha Shaji, Adhirashree V, Y. R. Satyaji Rao, Baranidharan S (2024) "Distribution, Characteristics and Ecological Risk of Microplastics in Beach Sediments along the Northern Coast of Andhra Pradesh, India" <i>Regional Studies in Marine Science</i>, Vol. 77, 103716, Dec 2024, (https://doi.org/10.1016/j.rsma.2024.103716) (ISSN: 2352-4855) 2. Vijaykumar Sekar, Sheha Shaji and Baranidharan S (2024) "Microplastic Prevalence and Human Exposure in the Bottled Drinking Water in the West Godavari region of Andhra Pradesh, India" <i>Journal of Contaminant Hydrology</i>, Vol. 264, 104346, May 2024 (Online ISSN: 0169-7722) (https://doi.org/10.1016/j.jconhyd.2024.104346) 3. Kheerthana Ramesh, Baranidharan S and Padmanaban Velayudhaperumal Chellam (2024) "Transport of layered and spherical microplastics in aqueous ecosystems: A Review" <i>Environmental Chemistry Letters</i>, Vol. 22, Pages 1221–1255, March 2024 (ISSN: 1610-3653) (https://doi.org/10.1007/s10311-024-01730-6) 4. S Ayothiraman, N Murugesan, G Sethi (2024) "Critical analysis of analytical techniques developed for statins in biological fluids, environmental and fermentation samples" <i>Critical Reviews in Biotechnology</i>, Pp 1-31, Taylor & Francis
Essential Qualifications required	B.Tech./MTech/ in Civil Engineering / Biotechnology/ Relevant Fields
Desirable Qualifications required	B.Tech./MTech/ in Civil Engineering / Biotechnology/ Relevant Fields

PROPOSAL NO. – 4

Title of the Proposal	Design and Development of NOMA Based Communication Frameworks for Smart Grids
Supervisor - I	Dr. V. Sandeep, <i>Electrical Engineering</i>
Supervisor - II	Dr. Kiran Kumar Gurralla, <i>Electronics and Communication Engineering</i>
E-mail IDs:	sandeep@nitandhra.ac.in kirankumargurralla@nitandhra.ac.in
Abstract	This work proposes a Non-orthogonal multiple access (NOMA)-based communication framework for Smart Grids, addressing efficient data exchange essential for modern energy systems. Traditional grids lack consumer awareness of energy use, causing inefficiencies. The framework supports demand-side management (DSM) by enabling real-time communication between consumers and suppliers. Leveraging IoT, smart energy management systems (SEMS), and smart meters (SMs), it generates load profiles (LPs) to optimize interactions and boost efficiency. Integration of NOMA-based device-to-device (D2D) and vehicular protocols (V2V, V2I, V2X) enhances flexibility. Fifth-generation (5G) systems expand data transmission capacity, allowing non-orthogonal resource sharing, which strengthens connectivity and system performance.
Keywords	Smart Grid (SG), Non-Orthogonal Multiple Access (NOMA), Smart Energy Management Systems (SEMS), Internet of Things (IoT), Smart Meters (SMs)
Relevant Publications	<ol style="list-style-type: none">1. B, Amrutha R, Vuddanti S, Salkuti SR. “Review of Energy Management System Approaches in Microgrids”. <i>Energies</i>. 2021; 14(17):5459, Sep 2021.2. Battula Amrutha Raju, Sandeep Vuddanti; “Distributed control strategy for secondary frequency regulation with EV demand aggregation and delay compensation in AC unbalanced microgrid”, <i>Electric Power Systems Research (Elsevier)</i>, Volume 225, 2023, 109782, ISSN 0378-7796.3. Nayak, V.N., Gurralla, K.K. A Novel Resource Allocation for SWIPT-NOMA Enabled AF Relay Based Cooperative Network. <i>Wireless Pers Commun</i> 118, 2699–2716 (2021).4. Nayak, V.N., Gurralla, K.K. Enhanced Physical Layer Security for Cooperative NOMA Network with Hybrid-Decode-Amplify-Forward Relaying via Power Allocation Assisted Control Jamming. <i>Wireless Pers Commun</i> 120, 2473–2490 (2021).
Essential Qualifications required	As mentioned in the advertisement for interdisciplinary Ph.D. (Full-Time) programme
Desirable Qualifications required	Knowledge in Smart Grids, Communication Systems and Skilled with MATLAB, Microcontrollers, IoT Devices.

PROPOSAL NO. – 5

Title of the Proposal	Enhancement of stress corrosion cracking resistance of Aero-Grade AA7XXX aluminium alloys: Experimental and Machine Learning Approach
Supervisor - I	Dr. Raffi Mohammed, <i>Metallurgical & Materials Engineering</i>
Supervisor - II	Dr. Kiran Teeparthi, <i>Electrical Engineering</i>
E-mail IDs:	raffimohammed@nitandhra.ac.in , kiran.t39@nitandhra.ac.in
Abstract	Aluminium-based alloys are among the widely used aircraft materials due to their unique factors such as moderately low cost, high strength-to-weight ratio, good stiffness, fracture toughness and ease of fabrication. In recent years, much research attention has been given to studies on Al-Zn-Mg-Cu-based (AA7XXX) aluminium alloys. Interestingly, no work was reported in the literature to understand the influence of four-step thermal ageing i.e., modified ageing (MA) on the stress corrosion cracking (SCC) behaviour. Hence, understanding the SCC behaviour is important to explore the remedies to overcome the problem of corrosion-related failures in service. This project aims to analyze the environmentally assisted cracking (EAC) behaviour of aero-grade AA7XXX aluminium alloy under different environmental conditions, viz., chloride concentration (Cl ⁻), Ph, Temperature and applied load. The present study aims to evaluate the microstructural characteristics and EAC resistance of AA7XXX, aluminium alloy specimens treated using thermal ageing (T6, T73, RRA and MA). Further, Machine learning techniques are adopted to analyze the experimental data and identify correlations between thermal ageing, microstructural characteristics, and SCC resistance.
Keywords	Aero-Grade AA7xxx Aluminium Alloy, Environmentally Assisted Cracking (EAC), Machine Learning (ML)
Relevant Publications	<ol style="list-style-type: none"> 1. Surjan Sheik, Raffi Mohammed, Atmaramudu Tirumalla, Arun Kumar Gurralla, Correlative Analysis of Morphology–Mechanical–Corrosion Behavior of Conventional Nickel-Based and Nitrogen-Alloyed Nickel-Free Austenitic Stainless Steels, <i>Journal of Materials Engineering and Performance</i> (Springer), 2022. https://doi.org/10.1007/s11665-022-07171-y, Impact Factor: 2.099. 2. Surjan Sheik, Raffi Mohammed, Kiran Teeparthi, et al. “Machine Learning-Based Prediction of Intergranular Corrosion Resistance in Austenitic Stainless Steels Exposed to Various Heat Treatments”, <i>J. Inst. Eng. India Ser. D</i> (2024). https://doi.org/10.1007/s40033-024-00675-y. 3. Y. Raghuvamsi, Kiran Teeparthi, “Detection and reconstruction of measurements against false data injection and DoS attacks in distribution system state estimation: A deep learning approach,” <i>Measurement</i>, Elsevier, vol. 210, pp. 112565, 2023, doi:10.1016/j.measurement.2023.112565 - SCIE, Q1, IF: 5.6. 4. Srihari Parri, Kiran Teeparthi, Vishalteja Kosana, “A hybrid VMD based contextual feature representation approach for wind speed forecasting”, <i>Renewable Energy</i>, Volume 219, 2023, Elsevier, doi: 10.1016/j.renene.2023.119391- SCIE, Q1, IF: 8.7.
Essential Qualifications required	M.Tech (Metallurgical & Materials Engineering/Materials Science/ Mechanical Engineering/Manufacturing/Allied Branches)
Desirable Qualifications required	Background in Python language and Basic in AI/ML/DL tools

PROPOSAL NO. – 6

Title of the Proposal	Development of FeCoV based High Entropy Alloys for Memory Applications
Supervisor - I	Dr. R. Sunil Kumar, <i>Metallurgical & Materials Engineering</i>
Supervisor - II	Dr. Ramudu Machavarapu, <i>DSOS(Physics)</i>
E-mail IDs:	sunil.rajulapati@nitandhra.ac.in ; ramudu@nitandhra.ac.in
Abstract	High-entropy alloys (HEAs) represent a novel class of materials with exceptional mechanical, thermal, and chemical properties. Despite their promising attributes, the magnetic behavior of HEAs remains relatively unexplored. This project proposes to investigate the magnetic properties of HEAs, aiming to elucidate the underlying mechanisms and explore their potential applications in magnetic devices. The study includes characterization of the structural and magnetic properties of selected HEAs, understanding the influence of composition and microstructure on their magnetic behavior, and establishing theoretical models to predict new HEAs. The methodology involves alloy development, microstructural characterization, magnetic property measurements, and understanding mechanism through theoretical modeling. The expected outcome would be the identification of HEAs with superior magnetic properties. This research is significant as it can contribute to the development of next-generation magnetic materials with enhanced performance and functionality.
Keywords	High Entropy Alloys, Powder Metallurgy, Mechanical Alloying, Magnetic Properties, Structural Characterization
Relevant Publications	<ol style="list-style-type: none"> 1. Rajulapati, S. K., et.al., (2016). Studies on alloying process of a ferritic/martensitic oxide dispersion strengthened (ODS) steel prepared by mechanical alloying of elemental powders. <i>Powder Metallurgy</i>, 59(5), 350–358. 2. Sunil Kumar Rajulapati, et.al., Effect of directional anisotropy on mechanical properties of 9Cr Ferritic/Martensitic ODS steels processed by mechanical alloying and powder forging, <i>Materials Today Communications</i>, Volume 37,2023,107220. 3. M. Ramudu, et.al., Investigations on structural, magnetic and calorimetric properties of $\text{Co}_2\text{FeSi}_{1-x}\text{B}_x$, ($x=0-0.5$) Heusler alloys: Role of boron, <i>J. Magn. Magn. Mater.</i> 490(2019) 165528. 4. M. Ramudu, et.al., Structure, magnetic properties and electrical resistivity of $\text{Co}_2\text{FeSi}_{1-x}\text{Ga}_x$ Heusler Alloy thin films, <i>J. Magn. Magn. Mater.</i> 418 (2016) 42-47. 5. M. Ramudu, et.al., Half-metallicity in Heusler type $\text{Fe}_2\text{Cr}_{1-x}\text{Co}_x\text{Si}$ alloys, <i>J. Phys. D: Appl. Phys.</i> 49 (2016) 055001 (8 pp)
Essential Qualifications required	Masters in Materials Science and Engineering / Metallurgy / Manufacturing / Physics
Desirable Qualifications required	Masters in Materials Science and Engineering / Metallurgy / Manufacturing / Physics

PROPOSAL NO. – 7

Title of the Proposal	Experimental and theoretical studies of structure, electronic and magnetic properties of quaternary Heusler alloys
Supervisor - I	Dr. Tapas Paramanik, <i>DSOS (Physics)</i>
Supervisor - II	Dr. Santosh Kumar Behara, <i>DMME</i>
E-mail IDs:	tapas.phys@nitandhra.ac.in , santoshkb@nitandhra.ac.in
Abstract	Heusler alloys with substantial band gaps exhibit unique properties like room temperature skyrmions, superconductivity, and half-metallicity. Recently, quaternary Heusler alloys (XX'YZ) have gained attention as a structural variant in this family, demonstrating half-metallicity suitable for spin-polarized magnetoresistive devices. This effect arises from a finite density of states in one spin sub-band and a band gap in the other at the Fermi level (E_F), creating 100% spin polarization. This project proposes an integrated experimental and theoretical study of quaternary Heusler alloys, investigating their structural, electronic, and magnetic properties through synthesis, characterization, and ab-initio Density Functional Theory (DFT) modeling.
Keywords	Half metallicity, Structural stability, Electronic properties, Magnetic properties
Relevant Publications	<ol style="list-style-type: none">1. Near room temperature giant magnetocaloric effect and giant negative magnetoresistance in Co, Ga substituted Ni–Mn–In Heusler alloy, T Paramanik, I Das, Journal of Alloys and Compounds 654, 399-403 (2016).2. Huge magnetoresistance and ultrasharp metamagnetic transition in polycrystalline $\text{Sm}_{0.5}\text{Ca}_{0.25}\text{Sr}_{0.25}\text{MnO}_3$, S Banik, K Das, T Paramanik, NP Lalla, B Satpati, K Pradhan, I Das, NPG Asia Materials 10 (9), 923-930 (2018).3. Strain-induced effects in the electronic and optical properties of $\text{Na}_0.5\text{Bi}_0.5\text{TiO}_3$: an ab-initio study, S Behara, GS Priyanka, T Thomas; Materials Today Communications 24, 101348 (2020).4. Crystal structure classification in ABO_3 perovskites via machine learning, S Behara, T Poonawala, T Thomas; Computational Materials Science 188, 110191 (2021).
Essential Qualifications required	Masters' degree in Physics/ Applied Physics/ Material Science, MME or relevant disciplines
Desirable Qualifications required	-