National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: DEVELOPMENT OF ECO-FRIENDLY BIONANOCOMPOSITE FILM USING COTTONSEED WASTE DERIVED PROTEIN AND CELLULOSE NANOCRYSTALS
Speaker	: Kishore Kumar G (Rollno : 523fp1004)
Supervisor	: Dr. Sushil Kumar Singh
Venue	: CH-113
Date and Time	: 19 Feb 2025 (11:00 AM)
Abstract	: The increased usage of plastics for food packaging applications causes pollution, greenhouse gas emissions, and waste accumulation, which are global concerns. This has captured the attention of researchers to develop biodegradable packaging material as an alternative to plastic materials. Agro-plant waste is a potential resource for biopolymers like protein and polysaccharides. Cottonseed waste such as cottonseed cake and hulls are the byproducts of cottonseed oil industries. They are often used as animal feed and fertilizers. They contain protein biopolymers and cellulose as their major constituents that can be used to produce biodegradable packaging materials. However, these biopolymer-based packaging materials inherently lag in certain properties of lower heat resistance, gas barrier properties, mechanical strength, etc. This study discovers the potential of cottonseed cake waste for biosynthesizing zinc oxide nanoparticles, and ultrasound-enhanced isolation of cellulose nanocrystals from cottonseed hulls. Also, this study will focus on modifying proteins using cold plasma treatment to enhance their properties for packaging applications. This modified protein biopolymer, zinc oxide nanoparticles, and cellulose nanocrystals will be used to develop eco-friendly nanocomposite materials. Hence the developed bio-nanocomposite will have antimicrobial properties, mechanical strength, and barrier properties needed for the packaging materials. Also, the cottonseed waste will be efficiently utilized to promote waste valorization and foster a sustainable circular bioeconomy.