

Week 2 (June 30-July 5, 2025)

1) Climate intelligence: Data Science for Sustainable Solutions

Department	Centre for Climate Studies
Eligibility	Senior UG (3rd & 4th Yr), PG & PhD from All branches of science and engineering
Prerequisite	Basic Knowledge on Climate Science or equivalent, Computation course or equivalent; Statistics course or equivalent
Course Overview	This course, led by Profs. Subimal, Subhankar, Jaideep, and Vishal, offers a comprehensive exploration of data science applications in climate studies. The program follows a structured format, with morning sessions (2 hours) dedicated to lectures and afternoon sessions (3 hours) focused on hands-on exercises. The curriculum covers key topics, including an introduction to data science (Subimal), monsoon modelling (Vishal), ecosystem modelling (Jaideep), and risk assessment (Subhankar). Additionally, real-world applications are explored through case studies such as rainfall and heatwave prediction (Vishal), urban flooding analysis (Subimal), agricultural water optimization ("More Crop per Drop"), vulnerability and risk mapping (Subhankar), and ecosystem modelling (Jaideep). This course aims to equip participants with the skills to leverage data science for sustainable climate solutions.

2) Group Testing: An Important Tool for Data Science

Department	Computer Science and Engineering
Eligibility	Senior UG (3rd & 4th Yr) from CSE, EE, ECE, Statistics
Prerequisite	None
Course Overview	Consider a set of n items that need to get tested for a certain defect. Group testing is a technique that replaces tests on the n individual by a set on $m < n$ groups of items, where each group consists of a subset of the n items. The aim is to save testing resources, (eg: time) due to the reduced number of tests (m instead of n). In the popular Dorfman's technique, the n items (e.g., one blood sample per subject) are divided into m disjoint groups, and each group is tested for a disease. Different groups are created from different subsets. The groups that tested negative for the disease are discarded. For those that tested positive, each participant of the group is then tested individually in the second round of tests. Apart from biological testing, there are many data science applications of group testing as well.

3) Waste to Wealth: Circular Economy and Sustainability

Department	Centre for Technology Alternatives for Rural Areas
Eligibility	UG, PG, PhD, Open to All branches
Prerequisite	None
Course Overview	This capsule course is designed to empower students with a comprehension of waste generation and innovative pathways for upcycling. Throughout the week, participants will delve into the intricacies of the circular economy model, exploring how waste materials can be reintegrated into the production cycle to minimize environmental impact. The course will also include the concept of value chain analysis, examining how different crops contribute to waste generation and identifying opportunities for value addition at every stage. By understanding the interconnectedness of various industries and the potential for synergy, participants will unravel avenues for creating new markets and driving economic growth sustainably. By harnessing the latent potential of waste materials, circular thinking, turning challenges into opportunities for creating a parallel billion-dollar industry while simultaneously promoting environmental sustainability.

4) Sustainability of Distributed Renewable Energy (DRE) Systems in Global South

Department	Centre for Technology Alternatives for Rural Areas
Eligibility	Senior UG (3rd & 4th Yr), PG & PhD, Open to All
Prerequisite	A basic understanding of energy units is beneficial (Not Mandatory)
Course Overview	This course is designed to introduce the participants to the critical role of the Distributed Renewable Energy (DRE) systems in fostering sustainable development within the Global South, simultaneously addressing the climate challenge. The course covers the fundamental concepts of the DRE systems, including their relevance, techno-economics, as well as the barriers and challenges in field implementation. The course will focus on solar PV and bioenergy applications in agriculture, residential and MSME sectors, and the issues related to their long-term sustainability in the developing countries. Through case studies and interactive sessions with stakeholders, the participants will be exposed to real-world situations and will also be introduced to various sustainability assessment tools. This course aims to develop better understanding regarding the potential role of DRE systems and equip the participants with the knowledge and skills necessary to contribute to the advancement of greener and cleaner energy solutions in the Global South.

5) Becoming” an Entrepreneur: Leveraging Your University and local ecosystems

Department	Desai Sethi School of Entrepreneurship
Eligibility	UG, PG, PhD: Open to All
Prerequisite	None
Course Overview	<p>Entrepreneurship goes beyond the idea of establishing a VC backed scalable startup, to roles like a social innovator or an intrapreneur in a large organization. It is now understood that the seeds of entrepreneurship have to be sown early on, for individuals to harvest its benefits as they progress in their respective careers. Students can leverage entrepreneurship support systems existing in their institutes, even as they continue their mainstream studies, to activate their entrepreneurial cognition and identity. This course would provide inputs in form of practices and frameworks which students can adopt towards building an entrepreneurial identity independent of whether they wish to create a new venture during the period of their education. Having an entrepreneurial identity and related skill sets is known to create opportunities for the individual across domains and across time, apart from the possibility of creating a new venture should the circumstances afford such a possibility.</p>

6) Energy Data Analytics

Department	Electrical Engineering
Eligibility	UG, Open to All Branches
Prerequisite	None
Course Overview	<p>This course explores the intersection of energy systems, data science, and machine learning. It begins with an overview of energy systems, with focus on electric grids and the critical role of data in this sector. Students will examine diurnal and seasonal variations in electricity demand and renewable generation and learn key concepts in energy markets, economics, and the transition toward smart grids and cities. The role of IoT and ICT in modern energy systems will also be discussed. The course will cover essential data analytics techniques, including time series analysis, data cleaning, preprocessing, and statistical analysis, all within the context of contemporary energy data. A wide range of data-driven applications in the energy sector will be explored through real-world case studies. These include forecasting electricity demand, renewable generation, and market prices, as well as developing decision support systems for demand-side management, home energy scheduling, industrial and commercial load monitoring.</p>

7) Waste to Energy

Department	Energy Science & Engineering
Eligibility	UG; Open to All Branches
Prerequisite	None
Course Overview	'Waste-to-Energy' technologies are not only relevant in generating green energy and fuel for various power, transport and industrial/thermal application, but also features as sustainable way in managing the animal, agricultural, industrial and municipal waste towards cleaner environment. The course will discuss about waste categorization and various waste to energy technologies, including biological, chemical and thermochemical conversion processes, and it's underlying principles. Course will have lectures and interactive lab session and demonstration of few wastes to energy conversion systems.

8) Immersive Arts in Virtual Reality

Department	IDC School of Design
Eligibility	UG, Preferably Design and Art (paint or sculpture) disciplines
Prerequisite	Good sketching ability and ability to think complex forms in 3D
Course Overview	The course is designed for students eager to explore art in a new dimension. It introduces participants to industry-leading VR creative tools, allowing them to experiment with painting, sculpting, animation, and calligraphy in a fully immersive environment. Students will learn how to harness the boundless potential of VR as an artistic medium, pushing the limits of imagination, interaction, and expression. Throughout the course, students will: Learn the fundamentals of VR art creation using industry-leading tools. Get exposure to diverse artistic styles in VR, from dynamic 3D painting to virtual sculpting. Confidently use VR-based artistic tools to create digital artwork. Collaborate on group VR art installations to push creative and technical boundaries. This program delivers a transformative learning experience by leveraging VR's unique capabilities, fostering creativity, innovation, and emotional expression. Additionally, the course incorporates creative art therapy principles, acknowledging the power of art as a means for enhancing emotional well-being and cognitive development.

9) Network & Cyber Security

Department	Industrial Engineering and Operations Research
Eligibility	PG, PhD from Computer Science, Electrical, Electronics and Communications, Information Technology
Prerequisite	Knowledge of programming in Python is preferred.
Course Overview	The course will cover basic aspects network security like firewalls, Intrusion Detection, Intrusion Protection, DNS poisoning, Distributed Denial of Service Attacks. ARP cache poisoning. Vulnerability Scanning and Penetration testing. We will delve in into Transport Layer Security and IPsec algorithms. On the Cybersecurity, we will discussion attack kill chain, various type of malware attacks, malware analysis, malware detection, SQL injection attacks. We will also explore use of AI/ML algorithms for detection of various cyber-attacks.