Week 2 (December 15-19, 2025)

Coastal-Ocean Resources, Engineering and Management:

Department	Civil Engineering
Course Instructor	Professor Prof. Gowri Shankar C
Eligibility	Open to all: UG, PG and PhD
Discipline	Open to all Disciplines
Prerequisite	Participants are expected to have full proficiency in English to ensure effective engagement with course materials and discussions.
Course Overview	This interdisciplinary winter school course offers a comprehensive introduction to the principles and practices of coastal-ocean engineering, management and sustainable resource utilization. Designed for students and early-career professionals, the program covers key topics including coastal processes, hazards and their mitigation, ocean resources such as wave/tidal energy/offshore aquaculture, and shore protection measures. Emphasis will be placed on the integration of coastal process-based approaches with environmental and socio-economic considerations for sustainable coastal development. Participants will engage with real-world case studies, lectures from experts, and a detailed exploration on the state of the art open-source numerical models. The course also explores policy frameworks and coastal zone management strategies to address climate change impacts and disaster resilience. By the end of the program, attendees will gain a solid foundation in coastal processes and engineering solutions, preparing them to contribute effectively to research, planning, and decision-making in coastal environments.

Group Testing: An Important Tool for Data Science

Department	Computer Science and Engineering
Course Instructor	Professor Ajit Rajwade
Eligibility	Senior UG (Third Year and Final Year), PG and PhD
Discipline	CSE, EE, Mathematics and Statistics, Operations Research, Data Science
Prerequisite	Exposure to basic algorithms, probability and statistics
Course Overview	Group testing is an area of information theory or data science which involves testing n samples for a defect in an indirect manner: You create m < n pools, where each pool contains a mixture of a random subset of the n samples, and you test the m pools instead of the n individual samples. This helps you save on tests and there are recovery guarantees to obtain the status of the n samples from the results on m pools with good accuracy. Group testing has many applications, including in pooled RT-PCR testing for COVID19. It also has many applications in data science, such as multi-label classification, efficient image classification and near neighbour search.

"Becoming" an Entrepreneur: Leveraging Your University and Local Ecosystems

Department	Desai Sethi School of Entrepreneurship
Course Instructor	Professor Sankalp Pratap
Eligibility	Open to all: UG, PG and PhD
Discipline	Open to all Disciplines
Prerequisite	Should give some credible evidence of interest in entrepreneurship
Course Overview	Economic Development is multidimensional and requires collaboration and contribution from different stakeholders. That said, the present-day scholars of different areas, managers and leaders need to be aware of the development discourse and the political economy associated with it. This course tends to sensitize the future researchers, scholars, leaders and experts of different areas about the meaning and different aspects of development along with the costs as well as the tradeoffs in growth and development in an economy like India. The course also makes them aware about the political economy of development using India as the country in case. Concepts like elite capture, cognitive capture, regulatory capture, rent seeking etc. will be discussed.

Power Electronics: Fundamentals and Practical Design.

Department	Electrical Engineering
Course Instructor	Professor Shiladri Chakraborty
Eligibility	Senior UG (Third Year and Final Year), PG and PhD
Discipline	Electrical Engineering, Electronics & Communication Engineering
Prerequisite	None
Course Overview	Power electronics is one of the key enabling technologies facilitating the efficient conversion and control of electrical power in applications like renewable energy systems, electric vehicles, data centres, etc. This course provides a comprehensive introduction to switched-mode power electronics, focusing on the operation and design of elementary power converter circuits. It begins with a review of key power semiconductor devices and explores the working principles of the half-bridge converters, covering both hard- and soft-switching techniques. Participants will gain a deep understanding of MOSFET datasheets, gate-drive requirements, and various gate-driver circuit topologies. Special emphasis is placed on the effects of parasitic inductances in converter operation and strategies to mitigate voltage ringing through careful gate-drive design, decoupling capacitors, and snubber circuits. The course also highlights best practices in PCB layout to minimize parasitics and enhance electromagnetic performance. By the end of the 5-day course, learners will become familiar with key principles of power electronic circuits and will be equipped with the practical knowledge required to design practical, robust switched-mode power converters.

Continuum Mechanics

Department	Mechanical Engineering
Course Instructor	Professor Amit Singh
Eligibility	Senior UG (Third Year and Final Year), PG and PhD
Discipline	Mechanical, Mathematics, Aerospace, Mechanical, Chemical, Physics, Material Science, Civil, Bioscience
Prerequisite	Basic understanding of algebra and calculus
Course Overview	Mechanics based upon concepts of time, space, matter, force, deformation and energy is the study of the equilibrium or motion of matter. Continuum mechanics is the determination of the internal condition of the continuum material body in response to external forces and energy sources. This course presents an introduction to the classical theory of continuum mechanics. The objective of the course is to make students familiar with vector and tensor algebra, kinematics, balance laws, constitutive relations and applications of continuum mechanics to problems of solids.

Political Economy of Development: Indian Experience

Department	School of Management
Course Instructor	Professor Ashish Singh
Eligibility	Open to all: UG, PG and PhD
Discipline	Open to all Disciplines
Prerequisite	None
Course Overview	Economic Development is multidimensional and requires collaboration and contribution from different stakeholders. That said, the present-day scholars of different areas, managers and leaders need to be aware of the development discourse and the political economy associated with it. This course tends to sensitize the future researchers, scholars, leaders and experts of different areas about the meaning and different aspects of development along with the costs as well as the tradeoffs in growth and development in an economy like India. The course also makes them aware about the political economy of development using India as the country in case. Concepts like elite capture, cognitive capture, regulatory capture, rent seeking etc. will be discussed.