Indian Institute of Technology, Kanpur

Proposal for a New Course

1. Course No: DES6XX

2. Course Title: Design for Life

3. Per Week Lectures:3(L), Tutorial: 0(T), Laboratory: 0(P), Additional Hours[0-2]: 0(A),

   Credits (3*L+2*T+P+A): 9 Duration of Course: Full Semester / ~~Modular~~

4. Proposing Department/IDP : Department of Design

   Other Departments/IDPs which may be interested in the proposed course: BSBE, CHE, CHM, MSE, ME, SEE

   Other faculty members interested in teaching the proposed course: N/A

5. Proposing Instructor(s): Dr. Himanshi Jangir

6. Course Description:

   Design, as a field, is an exploration that focuses on minimizing the divide between users and developers, enabling users to express, communicate, and engage more effectively with their environments. Empathy is central to the design process: understanding your user, standing in their shoes, being them, is how designers unlock user needs and desires and craft effective solutions.
   Human beings, the usual users, thrive on interactions, not just with humans, but with other living and non-living systems. The question is, how do we communicate with species that do not share a common language? We communicate through visuals, emotions, touch, and sounds, abstract yet powerful channels. Humankind is still exploring how we have established profound relationships with dogs, cats, birds, primates, and even honeybees.
   In this course, we will understand how life communicates, because to design for life, we need to design solutions that indulge all five senses and more. The course aims to inspire the design of a new generation of products and services and to venture down a new road of inventing modes of seeing, observing, and experiencing that we have not before.

   A) Objectives:

   1. To understand various modes of communication used by life forms and the associated sensory modalities.

   2. To utilise myriad forms of communication for the design of a new generation of interactive products and services.

B) Contents (*preferably in the form of 5 to 10 broad titles)*:

S. No	Broad Title	Topics	No. of Lectures
1.	**Communication via Olfaction/Chemicals**	**Case Studies:** 1. World of plants a. Plant-plant communication: Kin recognition among plants b. Selection of host plants by insect pests c. How plant-plant communication influences surrounding insects d. The underground communication between plants roots and microbes 2. White Rhinos and elephants: Dung piling to mark territory 3. Pheromones: Smell to recognize and distinguish peers 4. McClintock effect: Menstural cycle synchronization for females **Design exploration:** Products and strategies for health and agriculture: insect vector-borne diseases, insect repellants, flower and fruit production, intercropping to imrpove production and pest repellence. Cosmetic and mental health strategies: perfumes, aphrodisiacs, anti-anxiety and headache patches. Protection and survellainace of wild animals, anti-poaching strategies.	10
2.	**Auditory Communication**	**Case Studies:** 1. Insects: color and sounds to find mates 2. Canary Birds: A neurological enigma 3. Bats: Smallest mammals and their communication **Design exploration:** Air-warfare modules from the world of communicating bats. Adaptive music generators for VR modules and pest repellence. Ultrasonic sensors and echolocation devices.	5
3.	**Communication via Visuals (color and patterns)**	**Case Studies:** 1. Mandrils: Color as a marker of maturity 2. Zebra stripes: A pattern for survival 3. Camouflaging: Chameleon, cuckoo's egg, weather-associated colour change (snowshoe hare, caribou, ptarmigans) 4. Bioluminescence in nature and the mysterious magic of lights	8

		5. Fish Lenses: Adaptive optics for air and water vision **Design exploration:** Age-responsive and anti-pest branding, Underwater vision, designing colour schemes for strategic applications, technical textiles, bio-diagnostic tags, sustainable light production, and tunable lenses.	
4.	**Communication via Electromagnetic Waves (beyond visuals)**	**Case Studies:** 1. Reptiles: Infrared sensing 2. Flowers, butterflies, and Bees: Communication via Colours, patterns, and Smell 3. Crab vision **Design exploration:** Unexplored communication technologies, stealth technologies, strategies for augmenting honey production and increasing plant pollination.	5
5.	**Tactile Communication**	**Case Studies:** 1. Honey bees: Waggle dance 2. Whirligig beetles: Ripple generation 3. Primates: Allogrooming 4. Pray capture and plant defence: Venus flytrap, touch me not, pitcher plant **Design exploration:** Stealth technologies, devices for empathy, strategies for teamwork & embedded natural algorithms.	6
6.	**Multimodal Communication**	**Case Studies:** 1. Insects: vision, chemicals 2. Mating in birds: Manakin, a complex interplay of teamwork, presentation, and color 3. Honeybee colonies: Tactile and chemical communication 4. World of Elephants: Auditory, tacticle, olfaction, seismic communication **Design exploration:** Working family algorithms followed in the non-human world, the economics of labour distribution. Wildlife conservation strategies: Sustainable design strategies to protect animals in the wild and natural conservation strategies.	6

C) Pre-requisites, if any (*examples: a- PSO201A,or b- PSO201A or equivalent*): N/A

D) Short summary for including in the Courses of Study Booklet: Communication in nature is a complex interplay of engaging various sensory modalities that have evolved over billions of years. Design for Life is aimed at understanding these forms of communication of human and other life forms to design products and services that offer an overall immersive experience through cohesive integration of these multiple modalities.

7. Recommended books:

Textbooks:

1. The Design of Animal Communication. Edited by Marc D. Hauser and Mark Konishi, MIT Press, 1999
2. Animal Behavior: An Evolutionary Approach. John Alcock, 10th ed., Sinauer Associates, 2013
3. Communication in Plants: Neuronal Aspects of Plant Life. Edited by Baluška, František, Stefano Mancuso, and Dieter Volkmann, Springer, 2009

Reference Books:

1. Biomimicry: Innovation Inspired by Nature. Janine Benyus, HarperCollins, 1997
2. The Handbook of Communication Science and Biology. Edited by Kory Floyd and René Weber, Routledge, 2020
3. The Social Biology of Ropalidia marginata: Toward Understanding the Evolution of Eusociality. Raghavendra Gadagkar, Harvard UP, 2001.
4. Survival Strategies: Cooperation and Conflict in Animal Societies. Raghavendra Gadagkar, Harvard UP, 1990
5. The Living Elephants: Evolutionary Ecology, Behaviour, and Conservation. Raman Sukumar, Oxford UP, 2003
6. Field Notes on Science and Nature. Edited by Michael R. Canfield,Harvard UP, 2011.
7. Social Life of Animals. Sukanya Datta, National Book Trust, India, 2023
8. The Macaque Connection: Cooperation and Conflict between Humans and Macaques. Edited by Sindhu Radhakrishna, Michael A. Huffman, and Anindya Sinha, Springer, 2013.

8. Any other remarks:

Dated:13.2.2026 Proposer: Dr. Himanshi Jangir

Dated:_____ DUGC/DPGC Convener:_____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____