



Six Weeks Project Based Internship Programme Summer School on Underwater Domain Awareness (UDA)

11th Jun to 20th Jul 2019

Background- Revamping the Tertiary Education through Voluntary Pedagogy

India's tertiary education system is preparing for a renaissance. This tremendous undertaking comes with a backdrop of a fast-changing world, where it is increasingly becoming important to distinguish information from knowledge. Many influential universities of the orient and the occident have begun disseminating informative curriculum across the world through internet-based education services. These services however are agnostic to the aspirations of India and its populace. India, which is aiming to become a knowledge economy, is strongly placed to branch out of the long-standing foreign influence on its strategic 'educational' sector.

Our universities can now reform and begin to impart cutting-edge skills and practical pedagogy vital for India's future. This pursuit however needs to be undertaken in state-universities where a large fraction of India's student population graduates from. The speed at which our world is changing is relative to the speed at which science and technology is evolving globally. In order to be at the forefront of the changing global order, our state-universities can prepare to evolve from teaching- to research-based institutions. Such a transformation calls for replacing the obsolete curricula brick-by-brick with cutting-edge, trans-disciplinary, and practical pedagogies that break the rigid silos of disciplines and faculties.

Such curricula can come about from subject matter experts, who can voluntarily engage with teachers (through teacher-training and executive education programmes) and with young graduates (through capacity-building short-term summer and winter schools). Voluntary pedagogy can revamp the curriculum of state-universities, make it relevant to today's times and the needs of the region and country and help create trans-disciplinary research ecosystems around these universities.

Proposal

With this in backdrop, Mumbai University along with Vijnana Bharati Mumbai & Maritime Research Centre Pune will be carrying out a summer school of 6 weeks duration with an aim to promote the Underwater Domain Awareness (UDA) to addresses the aspect of **Safe, Secure and Sustainable Growth** in the maritime region, and with a purpose to-

- Setting a model to overhaul the nation's tertiary education system in state-universities in this domain
- Making most of the immense regional (ocean-going) capacities of Mumbai, Konkan Western Maharashtra and Goa
- Mobilization of vast human resource, through sustained and focused efforts, to attain national aspirations

The summer school will impart trans disciplinary exposure to graduate students from 11th Jun2019 to 20thJul2019. Students from following disciplines should be encouraged to participate.

S – Chemical, Biological, Physical, Environmental and Marine Sciences,

T – Technology, Architecture and Engineering Sciences

E – Economics, Law and Regulations, Political Science & International Relations

M – Management, Good Practices, Humanities, Business Operations

The summer school will involve tutoring and interactions from subject-matter-experts from:

- **National Security Apparatus** – Ministry of Defence (Indian Army, Navy and Coast Guard), Ministry of Home Affairs, and from Think Tanks.
- **Blue Economic Entities** – Offshore extractive (Oil-and-Gas, ocean-floor mining) and fishing industries, commercial ports, shipping and ship-building industries
- **Environmental Regulators and Disaster Management Authorities** – Law firms, constitutional environmental bodies, non-governmental organizations.
- **Science and Technology Providers**- Ministry of Earth Sciences, Ministry of Mines, Ministry of Science and Technology, Ministry of Petroleum and Natural Gas, Ministry of New and Renewable Energy, Department of Atomic Energy and Department of Space. DRDO and academic institutions.

Detailed Programme

The six weeks has been categorized into two main objectives

- Knowledge Enhancement, Upskilling
- Encouraging Thinking Abilities through Project Based Research & Analysis.

The participants will get exposure to the relevant stakeholders including industries, research organizations, strategic think tanks, users and more as part of the internship programme to be able to understand the requirements and also facilitate their skilling to make them employable. Domain experts will interact with the participants and guide them in the course of their projects. Experts from academia and research institutes will engage the participants during the knowledge based theoretical components.

The entire day will have six hours of academic programme comprising of contact lectures and interaction with experts and industry reps from Monday to Friday. The Saturdays will be dedicated to non-academic programme including team building activities and other enriching exposures.

The six weeks programme will be sub divided as under:

Week-1 Introduction Lecture Series

The first week will comprise of orientation of India's oceanic aspirations – the current social, technological, legal, economic and national security challenges and immediate prospects and opportunities – through a series of trans-disciplinary lectures related to Under water domain awareness to the students The lecturing subject-matter-experts will provide reference literature to the students.

In the first week, the students will be able to identify some of these experts as their mentors, thereby helping the students understand their elective projects, identify and formalize their project ideas (for the subsequent weeks) and present their appreciation of the subject.

Week-2 Exposure to Fundamental Theory

In the second week, the participants will be exposed to fundamental topics on analytics like Statistics, Machine Learning, Coastal Engineering, Signal Processing, and more to refresh them of the fundamental theory and analytic tools. Resource persons from the academia and research institutes of repute will take class room lectures and hands-on sessions. The participants start getting mature with their project ideas and also get sound knowledge on basics required to build-on their professional growth.

Week-3 Exposure to Cutting-Edge Topics and Advance Theory

This week will be focused on the more advanced topics like Robotics & Underwater autonomous Robotics, Artificial Intelligence, Deep Learning, Statistical Signal Processing, Big Data Analytics and more with hands-on sessions on Parallel Computing and High Performance Computing. The participants start applying their mind on multiple project ideas and innovative concepts. The participants have to do a thorough literature survey and evolve their thought on the project formulation.

Week-4 Familiarization with Industry Requirements

The Industry reps and R&D experts will interact with the participants from diverse fields to expose them to the industry requirements towards making them more employable. The participants will make presentations to panel of experts and the coordinator while formalizing their project ideas. They will get exposure to communication skills and technical presentation from experts through formal session's and one to one interaction. The participants will work on simulations and analysis to mature their project ideas. Expert interaction will continue during this week. They will interact with the academic advisers and experts to formalize the project ideas.

By the fourth week, the students will be able to assess and fine-tune their projects according to the demands of the industry and governmental projects.

Week-5 Exposure to Maritime Skills (Goa Phase)

The participants will get field exposure to maritime skills and participate in upskilling towards their employability to the maritime sector. Skills like acoustic surveys, archaeological surveys, noise & vibration surveys onboard marine platforms, diving, underwater surveys, port activities, shipyard activities and much more. There will be mix of laboratory demonstration and field visits. This exposure will allow them to understand the nuances of the multiple maritime skills and facilitate well informed selection of their future career options. Industry professionals already in the maritime sector will get a broad overview of theory and practice.

Week-6 Field Visit to Multiple Marine Industries/Institutes

The participants will get a one-week exposure to Goa's rich maritime scientific and industrial base. Goa University, NCAOR and NIO, will provide a one-week capsule including field trip to ocean research. Institutional exposure to the Indian Navy, Indian Coast Guard, DRDO Labs, Port, Shipyard and more will be included in this phase. Career opportunities in these organizations and qualification requirements will also be discussed. The participants will be encouraged to document their efforts in the form of a small article or project paper. The participants will submit a four-page write-up on their efforts to be included in a souvenir.

Learning Modules

The entire six weeks of the programme have also been categorized in multiple learning modules. There are two broad categorizations of the entire six weeks in terms of learning module. First is based on learning objectives and the second is based on target group of the participants.

Based on learning objectives the three categories are as follows:

Knowledge Enhancement The week 1 to 3 will comprise of basic and advance topics with fundamental tools for knowledge enhancement. These topics are broad based to make them aware of the critical technology areas across multiple sectors and also update them with the state-of-the-art. The hands-on sessions will ensure familiarity with certain critical tools for simulation and analysis to better appreciate the topics learnt.

Upskilling The week 4 to 6 will comprise of upskilling and mapping of knowledge base to the industry requirements. This upskilling also aims at making the participants more employable to the industry requirement. The participants will also get to know the career opportunities and skill requirements to enable them to make well informed choices and enable them to prepare themselves appropriately.

Encourage Thinking The entire six weeks will allow the participants to work on specific projects cutting across multiple stakeholders to facilitate thinking and application of the knowledge to bring out meaningful real world problem solving abilities relevant to the industry requirement. Research and analysis based projects will be guided and supported for the participants to carry forward back to their institutes along with field trials. Real data with field experimental validation will be encouraged as part of the project delivery for long term research and development initiative.

The program can be categorized into three groups for the skills sets imbibed in this period.

Refresher Course The first three weeks of the programme will form the Refresher Course for Faculty Members from Academic Institutes and Practitioners from Stakeholders with knowledge based exposure. Under the UGC-HRDC norms this phase will be offered to faculty members across the country and will be hosted at HRDC Mumbai University and HRDC Goa University. Executives from the stakeholders will also benefit from this phase to refresh their basics. The participants at the end of the refresher course will get a certificate of participation. There will be no evaluation in this component. AICTE recognition is also being worked out.

Certificate of Competence The first four weeks of the programme will comprise of knowledge based and skill based exposure for all category of participants including students, faculty members and practitioners. Credit allocation under UGC is being worked out for participating in this phase as part of their ongoing degree programme for students. Upto 9 credits will be allocated for this programme. Under Graduate students will be allocated these credit points against their internship phase and Post Graduate students will be allocated these credit points against their seminar phase. Practitioners and faculty members can use these credit points in case they intend to enrol for academic programmes under UGC governed institutes for MS/PhD. There will be evaluation in the form of interaction with experts and mentor prior to award of the Certificate of Competence. The participants will have to submit a brief paper for the award of the certificate. This certificate of competence will be recognized by the industries during placement evaluation as well. AICTE recognition is also being worked out.

Certificate of Proficiency The entire six weeks of the programme will comprise of knowledge based, skill based and thinking based exposure for all category of participants including students, research scholars, faculty members and practitioners. Credit allocation under UGC is being worked out for participating in this phase as part of their ongoing programmes for students. Upto 12 credits will be allocated for this programme. UG students will be allocated these credits against internship and project phase whereas PG students and Research Scholars can use these credits against seminar and project thesis. Practitioners and faculty members can use these credits points in case they intend to enrol for academic programme under UGC governed institutes for MS/PhD. This will be very useful for identifying their topic of research. There will be evaluation in the form of presentation to a panel of experts prior to award of the Certificate of Proficiency. The participants will have to submit a detailed paper for the award of the certificate. This certificate of competence will be recognized by the industries during placement evaluation as well. AICTE recognition is also being worked out.

All participants will have to attend the entire six weeks to get any kind of recognition and certificate.

Organizational Structure

The Summer School 2019 will be jointly hosted by University of Mumbai, Vijnana Bharati Mumbai, Maritime Research Centre, Babasaheb Ambedkar Technology University and Goa University. The entire programme will be managed and guided by a high level committee for a comprehensive human resource development vision for young India.

Mentors

Dr RA Mashelkar

President Global Research Alliance

Dr Vijay P Bhatkar

Chancellor Nalanda University

Dr Anil Kakodkar

Former Chairman Atomic Energy Commission, Director-BARC

Chairman Rajiv Gandhi Science & Technology Commission

Dr V K Saraswat

Former DG DRDO & Member NITI Aayog

Patrons

Dr G Satheesh Reddy, Chairman DRDO

Dr Shekhar C Mande, DG CSIR

Prof D P Singh, Chairman UGC

Dr M Rajeevan, Secy MOES

Prof. Suhas Pednekar, VC University of Mumbai

Prof Varun Sahni, VC Goa University

Shri Madhu S Nair, CMD Cochin Shipyard Ltd.

Shri Jayant D Patil, Director L&T's Defence Business

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Dr Anil Sahasrabudhe, Chairman AICTE

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Vice Admiral DSP Varma (Retd), MRC Adviser

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A note on Underwater Domain Awareness

The concept of Underwater Domain Awareness (UDA) in a more specific sense will translate to our eagerness to know what is happening in the undersea realm of our maritime areas. This keenness for undersea awareness from the security perspective, means defending our Sea Lines of Communication (SLOC), coastal waters and varied maritime assets against the proliferation of submarines and mine capabilities intended to limit the access to the seas and littoral waters. However, just the military requirement may not be the only motivation to generate undersea domain awareness. The earth's undersea geophysical activities have a lot of relevance to the wellbeing of the human kind and monitoring of such activities could provide vital clues to minimize the impact of devastating natural calamities. The commercial activities in the undersea realm need precise inputs on the availability of resources to be able to effectively and efficiently explore and exploit them for economic gains. The regulators on the other hand need to know the pattern of exploitation to manage a sustainable plan. With so much of activities, commercial and military, there is significant impact on the environment. Any conservation initiative needs to precisely estimate the habitat degradation and species vulnerability caused by these activities and assess the ecosystem status. The scientific and the research community need to engage and continuously update our knowledge and access of the multiple aspects of the undersea domain. Fig. 1, presents a comprehensive perspective of the UDA. The underlying requirement for all the stakeholders is to know the developments in the undersea domain, make sense out of these developments and then respond effectively and efficiently to them before they take shape of an event.

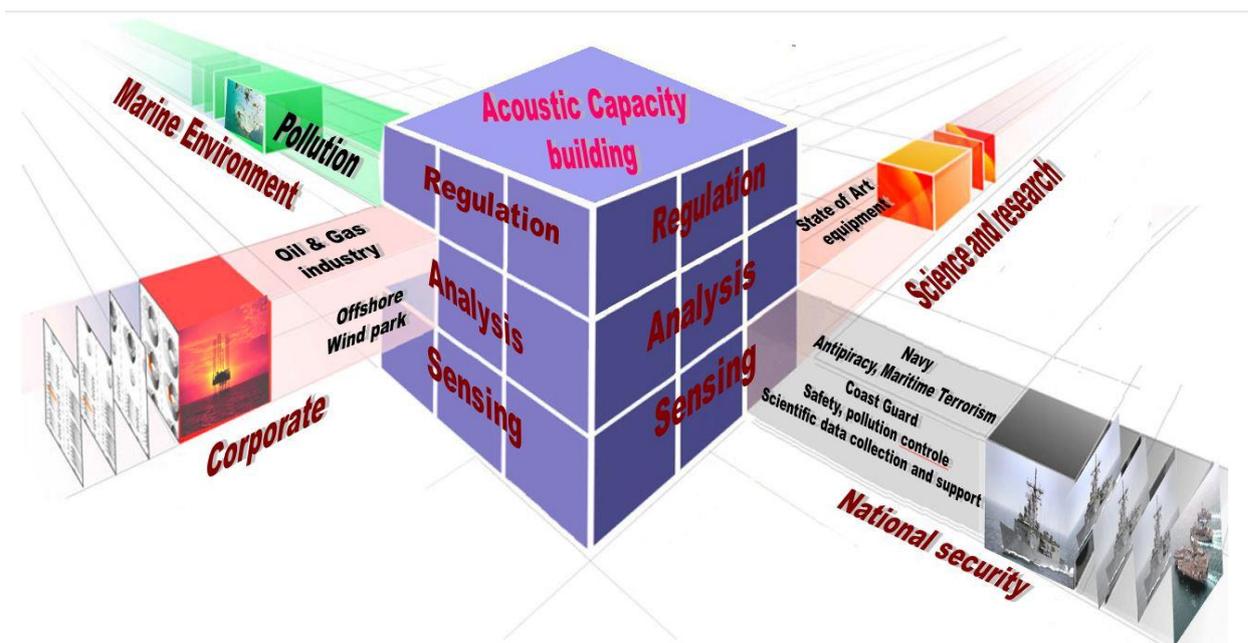


Fig. 1 Comprehensive Perspective of Undersea Domain Awareness

The UDA on a comprehensive scale needs to be understood in its horizontal and vertical construct. The horizontal part would be the resource availability in terms of technology, infrastructure, capability and capacity specific to the stakeholders or otherwise. The vertical part is the hierarchy of establishing a comprehensive UDA. The first level or the ground level would be the sensing of the undersea domain for threats, resources and activities. The second level would be making sense of the data generated to plan security strategies, conservation plans and resource utilization plans. The next level would be to formulate and monitor regulatory framework at the local, national and global level.

The figure above gives a comprehensive way forward for the stakeholders to engage and interact. The individual cubes represent specific aspects that need to be addressed. The stakeholders, science and technology providers and academia can pick up specific cubes to contribute towards the national cause. It will enable more focused approach and well defined interactive framework. The students can choose their project ideas very effectively and also seek interactions with the relevant stakeholders and generate opportunities. Given the appropriate impetus, the UDA framework can address multiple challenges being faced by the nation today. Meaningful engagement of Young India for Nation Building, probably is the most critical aspect that deserves attention.