

Summary Report

About Department/Center/School: *The Department of Naval Architecture and Marine Engineering was established at I.I.T. Kharagpur in 1952 with eleven students of the B.Tech. (Hons.) course. In 1976, the Department was renamed as the Department of Naval Architecture. For the last twenty years, it is known as the Department of Ocean Engineering and Naval Architecture. Besides offering the B.Tech. and M.Tech. programmes in Ocean Engineering and Naval Architecture, the Department also offers a 5-year dual degree M.Tech. program and research programs leading to M.S. and Ph.D. degrees in the different research areas of the Department.*

1. Academic Programs (Range of Degrees and Disciplines):

(i) B.Tech (4 Year), (ii) M.Tech (Dual 5 Year), (iii) M.Tech (2 Year), (iv) M.S. Program, (v) Ph.D. Program

2. Major 4-5 Thrust Areas of Research:

Marine and Ocean Hydrodynamics, Coastal Processes & Engineering, Marine & Ocean Structures, Marine Design & Production

3. Curriculum and Courses & Teaching Environment

Items	Ratio/ Number	Items	Number/%
Teacher-student Ratio	1: 23	Average No. of students motivated (%) to opt of careers Eng/ Tech. Sectors UG/PG/PhD	80/20
No. of Faculty members as on today	13	Average No. of students motivated (%) to opt of careers in Science sectors UG/PG/PhD	Not Applicable
Average No. of Tutorial Assistants	10	No. of teaching labs	05
No. of UG/DD students	249	Average No. of students per experiments in core courses	05
No. of PG students/PhD students	31 (PG) 16 (Ph.D)	No. of Students' workshops/`Tinkering` Labs	01
Average no. of tutors with more than 100 students	Not Applicable	No. of new courses introduced	NIL
Average Students placements (%) (UG/DD/PG)	95%	No. of New program introduced	NIL
No of major curriculum review in both UG & PG level	Practice as laid by Institute	Undergraduate Vs PhD strength expressed as Percentage	6.5%
No of UG lab (teaching labs) developed/set-ups	06 (Aut.) 03 (Spr.)	No of PG/research labs developed/new set up	02 (Labs Renovated)
No of E class rooms	03	No. of lab classes per week	07
Average No. of Course done per student for B. Tech/DD/M. Tech/Ph.D	45/50/12/5	No. of core/elective/seminar/projects subjects taken for B. Tech, DD, and M. Tech respectively	48/08/02/02 49/13/04/04 05/08/02/02

4. Research and Development & its Environment

Items	Number	Items	Number	Items	No.
Total No. of Publications in Journals (2008-13)	120	Average no. of citation per paper	4.0	No of large interdisciplinary research projects	01
Total No. of Publications in Conference & Symposium	50	Average Journal publication per year	35	Number of Int. conf./workshops attended by students	35
Total No of Books & e-books published	02	h-Index of the department since 2008/overall h-index in Scopus	9/34	No. of PDF hired in the Institute	04
Total No of Edited Conference Proceedings/book chapters	02	Number of papers with citation more that the average no. of citation of the Journals	-	No. of international Students as PhDs/PDFs	NIL
Total No. of Technology Developed/transferred	01	No. of recognitions & Awards, fellows etc to faculty/students (provide break up if necessary)	07	No. of International visiting researchers/adjunct faculty stayed here for at least a week	01
Total No. of Patents Filed/Obtained	02	Average Retention(%) of Young faculty for at least 10 years	86	No. of short courses/ workshops /conf. organized with int'l participations	08/07/03
Total No. of Copyright Filed/Obtained	05	No. of Sponsored research Project /fund(lakh) generated from non-internal source	30 / 1777.1 Lakhs	Average No. of PhD granted per year	3.0 – 4.0
No. of Publications per Faculty/Masters/PhD students	08	No. of Consultancy /fund (lakh) generated from non-internal source	38 / 340.35 Lakhs	Average No. of PhD Granted per year per faculty	1/3
No. of Publications per Faculty/ Masters /PhD students in top Ten Journals as Identified by the department	04	No of Internal and external Collaborations research papers/research projects/PhD students	33/10/03	Patent granted per faculty	NIL
Average No. of Citation per faculty per year	08	No of M. Tech students motivated into pursuing PhD/PhD graduates motivated to pursue career in academics (abroad or IIT etc)	20-30%	Number of articles in collaborations with Ten countries*	17

Ranking of the department in terms of average citations per paper within the Institute	24	Ranking of the department in terms of total number of Journal publications within the Institute/publications per faculty	24/23	No of articles of the dept. contributing towards h-index of the Institute since 2008	NIL
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5. External Stakeholder Engagement and others

Items	Number	Amount Lakh
No. of PhD/Master students' thesis funded by Industries	02/35	
Total number of Industry sponsored projects and its income (Lakh)	38	3,40.35
No. of Curriculum Development Initiative for Industries	NIL	
No of Technology transfer/adopted by Industry/Labs	01	2.0
No. of Nationally relevant research projects	30	17,77.10
No of Policy inputs/consultancies provided	10	
No. of Research grant and seed money from internal savings of the Institute per young faculty of the department and its total fund	00	NIL
No. of Community Relevant projects	00	NIL

6. Vision for the Future (in brief):

(a) Departments/centers/schools should spell out its Mission and Vision Statements, (b) Plans for future to achieve the projected goals and (c) measures adopted towards above.

(a) The vision of this Department is to create next-generation Naval Architects and Ocean Engineers capable of meeting the challenges of utilizing the ocean resources and marine transportation for the benefit of the entire mankind.

(b) To achieve the projected goals, the academic program and areas of research of the Department place emphasis on cutting-edge knowledge in the fields of marine structures, marine hydrodynamics, design and production of marine vehicles & offshore structures and coastal processes and engineering.

(c) The measures adopted include development of a Computer Aided Design and Manufacturing Laboratory. The laboratory's research centers on Ship Design, Advanced Manufacturing, Distributed Information Systems, and Life Cycle issues. A Computational Marine Hydrodynamics Laboratory has been set up to advance the knowledge base and to create expert manpower in the area of marine hydrodynamics, coastal processes and engineering. The Marine Construction Laboratory has been setup to enhance the research in the area of weld related issues of large ship structures under the active collaboration with Joining and welding Research Institute of Osaka University. Additionally, emphasis is on increasing the PhD (sponsored category) intake by collaborating with various shipyards, scientific laboratories, and private/government engineering institutions.

7. External peer review of the Dept./centre/schools (in brief):

(a) Date of the peer review: 04 February, 2013

(b) Name of the Experts involved and their affiliations in short:

- (1) Prof. R P Gokarn, Ex-Professor, IIT Kharagpur;
- (2) Mr. K K Palit, Ex-Director, Shipping Corporation of India;
- (3) Prof. K K Dileep, Professor & Head of Ship Technology, Cochin University of Science & Technology, Kerala
- (4) Capt. K J H Christie, Larsen & Toubro (Ship Building)

(c) Measures adopted/action taken at the department level to address the recommendations of the peer review report:

Appropriate action has been initiated based on the recommendations of the Committee.

8. Strengths, Weaknesses, Opportunities & Threats (SWOT) Analysis of the Department

STRENGTHS Strength of Department includes diverse fields such as Ocean & Marine Hydrodynamics, Marine Design & Production, Coastal Engineering, CFD, Ocean Structures and Ocean Environmen, Naval Architecture & Ship building	OPPORTUNITIES There are many opportunities today especially in the field of Offshore Engineering and Ocean Renewable energy resources. The students are employed in core areas of naval architecture and offshore-related industries.
WEAKNESSES Sub-sea Engineering	THREATS Lack of suitable faculty

9. Additional Information, if any

The Department is in the process of upgrading the infrastructure and augmenting the existing laboratory facilities taking into account the increase in student's strength. During the last six decades, most of the infrastructure has become obsolete. Some of the facilities are upgraded during the last 5 years, and efforts are being made to upgrade most of the infrastructure.

***Note: Ten countries: US, UK, Germany, Japan, Canada, France, Italy, Australia, Singapore, South Korea (optional :China may be replaced with anyone if department wants)**

Important Highlights

Department of Ocean Engineering and Naval Architecture

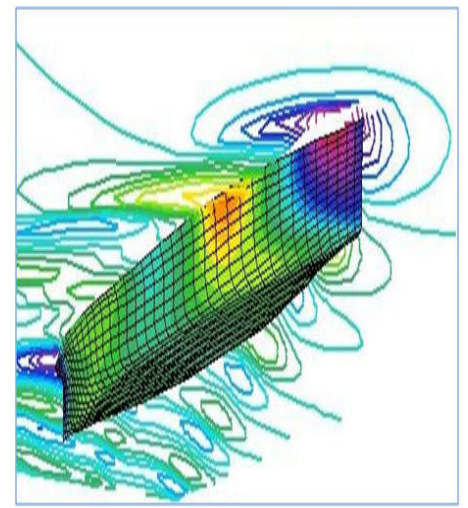
The Department of Ocean Engineering and Naval Architecture was established in 1952 as the Department of Naval Architecture and Marine Engineering. It was the first of its kind in the country. Over the next 60 years of its existence, the Department has made significant contributions to the development of shipbuilding, shipping and marine-related industries in the country. In addition to teaching and training at the various levels of bachelors, masters and doctoral programs, the Department is actively involved in various research and industrial projects sponsored by government, research organizations and industry.

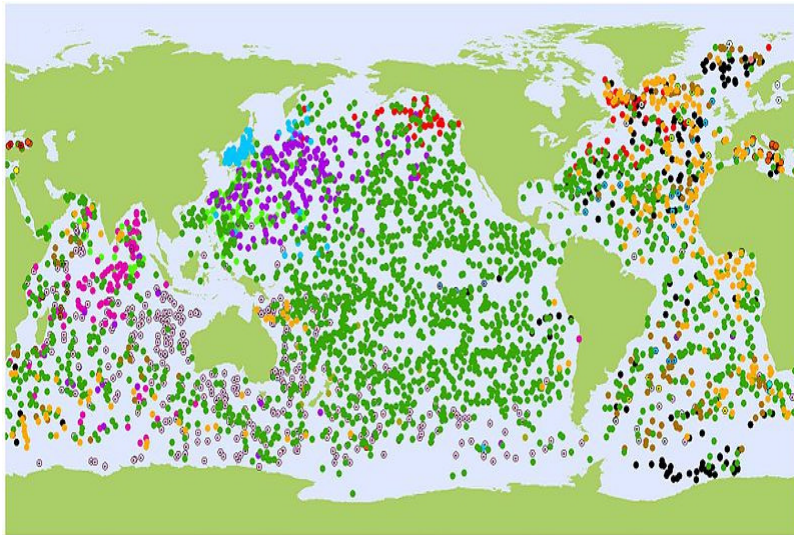
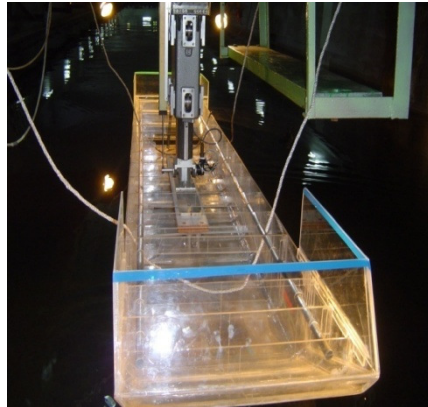
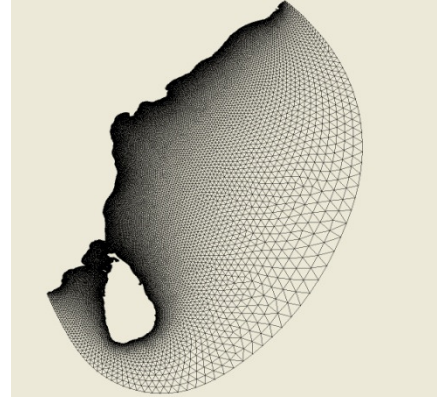
In order to provide a multidisciplinary knowledge base, the course curriculum is framed by integrating many disciplines in engineering sciences, physical sciences, mathematics, humanities and management. The academic programs prepare students for a highly rewarding career in this rapidly expanding field. The academic and research programs are designed emphasizing on cutting edge knowledge in the subject areas of marine structures, hydrodynamics, ocean environment, offshore technology, design of marine vehicles & systems, marine production and planning. Various laboratories of the Department provide opportunity to the students to gain valuable practical hands on experience. Laboratory work and design projects are incorporated extensively throughout the academic curriculum by means of the core and elective laboratory courses. The Department has several laboratories and facilities created over the years and these include the Ship Hydrodynamics Lab, Circulating Water Tunnel, Welding and Marine Construction Lab, Structure and Vibration Lab, and the Model Making Workshop.

Industry-Academia Interaction

During the period 2008-2013, following courses/training programs were organized for various R & D organizations in the country including shipping industry.

- Welding course in association with Univ. of Glasgow was organized for Indian Shipbuilders
- Niche courses in structured topics were offered to DRDO scientists
- Tailor made short-term courses have been running for Mazagon Dock Ltd., Mumbai for last eight years.
- Short-term courses for L& T ship building was offered.
- Tailor made short-term courses have been proposed for young engineers and mid-level executives of Garden Reach Shipbuilders and Engineers Ltd.
- Large number of courses in video mode are being developed under NPTEL program to meet the requirement of industry and academia.





Projects

The Department is actively involved in research on diverse areas of Ocean Engineering and Naval Architecture, which have earned reputation both at National and International level. Dept. undertakes both sponsored and consultancy projects from R & D organizations and industry funded by both Government and Private sectors. Some of the ongoing/completed projects over last few years are as below.

Sponsored Projects

- Experimental validation of theoretical models on sediment settling velocity and suspended sediment concentration using OCEANSAT data
- Implementation of an Integrated Nested Wave-Current-Surge Model with improved Air-Sea coupling parameterization for Kalpakkam region
- Development of Cage for Mariculture through Numerical and Physical Modeling
- An investigation into the maneuvering performance of ships in shallow navigation channels around Indian coast under different weather conditions
- Research on ship maneuvering and propulsion performance using data from Voyage Data Recorder (VDR) and Automatic Identification System (AIS)
- Coastal Protection in the Mahakalpara area of Kendrapara district, Orissa
- Weld Induced Distortion Analysis of 3-D Large Ship Structures
- National Program in Marine Hydrodynamics
- Hydroelastic Analysis of floating and Submerged Structures
- Development of an autonomous underwater vehicle
- Application of Oceansat-II data for development of a ship weather routing and safe navigation system
- Development of a compositionally graded coating on marine propeller for improving cavitation corrosion resistance
- Development of Friction Stir Welding Process for Shipbuilding
- Control of Ballast Water Problems in Ships through Design Development
- Real-time modeling of ocean dispersion
- Improved physical parameterization in a third generation wave prediction model

Consultancy projects

- Impact of Storm Surge, Wind Waves and Seiches on the design of proposed Kalpasar Dam
- Modeling of half moon bay
- Hydrodynamic Design & Design of Control Surfaces for AUV
- Hydrodynamic Design & Development of Trimarans and Delta Hull Forms
- Advice on Preparation of Course Module on Ship Production
- Consultant for Project 'Indigo'
- Hydrodynamic design of high speed light weight torpedo
- Development of software for computing added wave resistance
- Hydrodynamic analysis of fishing vessels
- Research on ship maneuvering using PMM captive tests and validation based on full scale maneuvering experiments
- Resistance and self-propulsion test for 200 T self-propelled barge
- Resistance and self-propulsion test for MOPV
- Design of a mini bucket dredger
- Sea keeping model test for vessel ORV SagarManjusha
- Welding Distortion Analysis of Port Plug, ITER-India, Institute of Plasma Research, Ahmedabad.
- Hull structural analysis using FEM of one number 74m long Offshore Patrol Vessel, Garden Reach Shipbuilders and Engineers Ltd.,
- Fatigue analysis of the Platform and Seat for AK630 Gun in Naval OPV, Goa Shipyard Ltd.
- Technical services in respect of leaf type Lock Gates at Kidderpore Dock, Kolkata Port Trust.

Placement Opportunities

The Department has an excellent placement track record and students are well placed in diverse field such as Naval design, Shipyards, Offshore industry, Software industry, Financial analysis, Marketing etc.

Vision of the Department

The vision of the Department is to create research and teaching excellence in some of the core areas of Ocean Engineering & Naval Architecture that includes disciplines like Marine Hydrodynamics, Marine Design & Production, Marine Structures and Ocean Environment.

The Dept. is continuously changing the teaching courses as per the need of industry and trend in academics. In the coming ten years, emphasis will be on appointing adjunct faculty from Industry. Dept. has offered several video courses under the NPTEL program of MHRD and more courses will be added in the frontier areas in the coming years. Additional electives will be introduced keeping the trend of marine industry. Workshops and short-terms courses will be organized to meet the industry requirement and creating awareness on the frontier areas of marine science and technology. The Department is in the process of introducing International summer/winter terms into the academic programs from the current academic year. Since January, 2014, the Dept. is providing training program involving faculty across various discipline within the Institute to Govt. officers of both Gujarat and West Bengal under integrated Coastal Zone Management Project in different batches.

Department will enhance the ongoing research activities in the areas of marine hydrodynamics, design and production, ocean environment. The offshore renewable energy is another area that requires capacity building in terms of manpower and research. Further, in the coming years, department will broaden the research activities in areas like: (i) experimental and theoretical validation of sedimentation patterns, boundary layer studies in estuarine environment, (ii) ocean wave and river current energy converter, (iii) hydroelastic analysis of ship and very large floating structures, (iv) offshore pipelines and pipe-laying, marine risers, offshore drilling, (v) offshore floating wind turbines, (vi) coastal hydrodynamics, coastal structures, storm surges and coastal inundation. In brief, study on deep water hydrodynamics, coastal hydrodynamics, metocean engineering, design of floating and fixed offshore structures and wave/current energy devices will be the focus of the department in the coming decade.

Additional Programs

The Department runs a National Program in Marine Hydrodynamics sponsored by Naval Research Board (DRDO) which aims to bridge the knowledge gap in Marine Hydrodynamics and develop indigenous R & D capabilities on Naval Systems. More details can be found in the following link:

<http://www.iitkgp.ac.in/npmh/index.html>

The Earth Science & Technology Cell (ESTC) sponsored by Ministry of Earth Sciences, Govt. of India, is presently operating under this Department to promote research and stimulate original path-breaking scientific work on ocean science and technology. More details can be found in the following link:

<http://oastc.iitkgp.ernet.in/index.php>