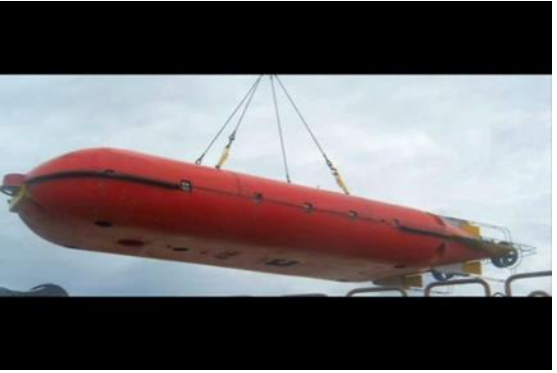
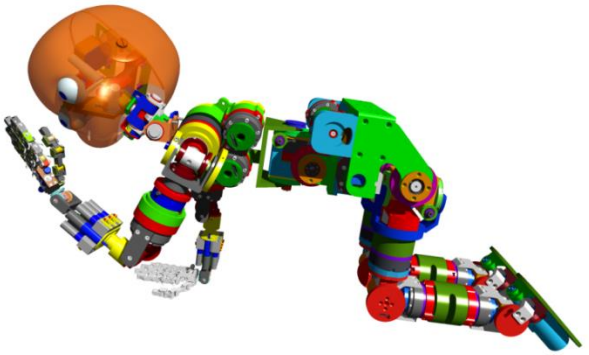
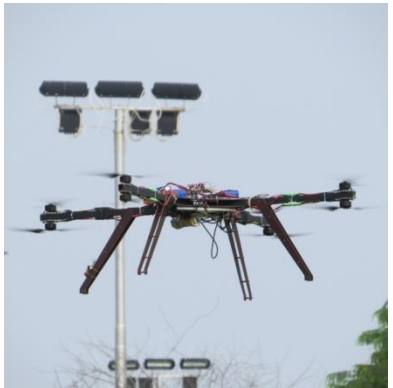




IDDD Program

Robotics



Learning Outcomes:

Students graduating with a dual degree in Robotics shall be capable of understanding and analyzing the following:

- Basic robotic technologies used across various applications
- Kinematics, dynamics, and control of Industrial and field/service robots
- Sensing, perception, planning, and control applied to autonomous robots
- Application of Artificial Intelligence, Neural Networks and Reinforcement learning in Robotics
- Hardware systems and controllers used in robotics
- Design of robotic systems for new applications

IDDD Program- Structure

Total Credits reqd:	:155 to 160
No. of PMT CORE courses :	: 3 (33 credits)
No. of electives	: 4 (36 credits)
No. of CORE labs.	: 1 (6 credits)
Project work/internship	: 1 (85 credits)

IDDD Program- Structure

- **Three core theory Courses: C**overing the mechanical, electrical, computer science fundamentals, and applications.

Core courses:

ID6040: (6th Semester)This will be a bridge course for the students from all streams (12 credits, Bridge Course)

ED 6007: 7th Semester (12 credits)

ED 5315: 9th Semester (9 credits)

- **One core Lab. Course:** ID6100 (6 credits) 9th sem
- Project work/Internship: 8th sem, 9th sem, 10th sem
- **FOUR elective courses** on any area related to robotics (control, sensing, planning, etc.). Students can choose the courses from three baskets of courses offered by faculty. Electives to be chosen from at least two baskets.

		Basket 1						
1	AS5012	Dynamics and control of rotorcraft	3	0	0	0	6	9
2	AS5040	Flight Mechanics	4	0	0	0	8	12
3	AS 5010	Aerodynamics and Aircraft Performance	3	0	0	0	6	9
4	AS5340	Advanced flight mechanics	3	0	0	0	6	9
5	AM5010	Biomechanics	3	0	0	0	6	9
6	AM5190	Haptics in Biomedical Engg	3	0	0	0	6	9
7	AM5011	Virtual Reality Engg.	3	0	0	0	6	9
8	ED5314	Design, analysis and control of Robot Manipulators	3	0	0	0	6	9
9	OE 5011	Marine Robotics	3	0	0	0	6	9
10	ME7010	Microprocessor in automation	3	0	0	0	6	9
11	CE6011	Smart buildings and automation	3	0	0	0	6	9
12	ED5040	Human Anatomy Physiology and Biomechanics	4	0	0	0	88	12
13	ED5160	Automotive systems	4	0	0	0	8	12
		Basket 2						
1	CS5011/ EE5177	Machine Learning for Computer Vision	4	0	0	0	8	12
2	CS6380	Artificial intelligence	4	0	0	0	8	12
3	CS6700	Reinforcement learning	4	0	0	0	8	12
4	CS7015 5160	Deep Learning	4	0	0	0	8	12
5	CS6350/ EE5175	Computer Vision/ Image Signal Processing	4	0	0	0	8	12
6	CS6777	Optimisation for computer vision applications	4	0	0	0	8	12
		Basket 3						
1	EE5541	Synthesis of control systems	3	0	0	0	6	9
2	EE6417	Allied topics in control systems	3	0	0	0	6	9
3	EE6412	Optimal Control	4	0	0	0	8	12
4	EE5340	Microelectro mechanical systems	3	0	0	0	6	9
5	EE5410	Introduction to DSP	4	0	0	0	8	12
6	EE5177/ CS5011	Machine Learning for Computer Vision	4	0	0	0	8	12
7	EE5175/ CS6350	Image Signal Processing	4	0	0	0	8	12

Faculty Coordinators

- Asokan T (ED)
- Ravindran B (CS)

Robotics Faculty

Nandan Kumar Sinha	**AE**	**Aerial robots, Control systems**
Manivannan M	AM	Haptic systems
Bobby George	EE	CFI
Anurag Mittal	CS	Vision systems, image processing
Chandrasekhar C	CS	Machine Learning
Deepak Khemani	CS	Planning algorithms
Narayanaswamy NS	CS	Planning algorithms
Arunkumar D. Mahindrakar	EE	Mobile robots, control algorithms
Nitin Chandrachoodan	EE	Embedded systems
Krishna Vasudevan	EE	
Asokan T	ED	Underwater robots, Medical robots
Sandipan Bandyopadhyay	ED	Parallel Manipulators
Somasekhar SH	ME	Kinematics, Dynamics
Rajiv Sharma	OE	Underwater robots
Ravindran B	CS	Machine Learning, probabilistic planning
Sampath V	MM	Smart materials and actuators
Joel George	AE	Aerial robots

ID: 6040 Introduction to Robotics

(bridge course to be offered as a core course for the minor stream in Robotics)

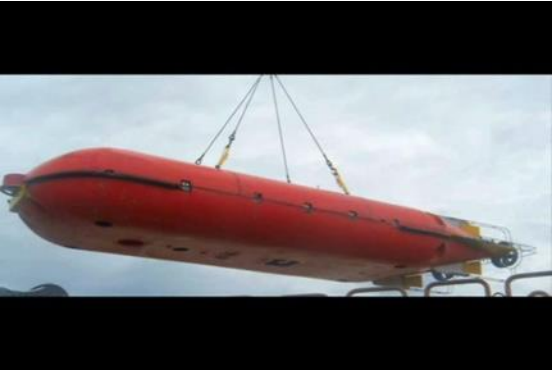
Syllabus:

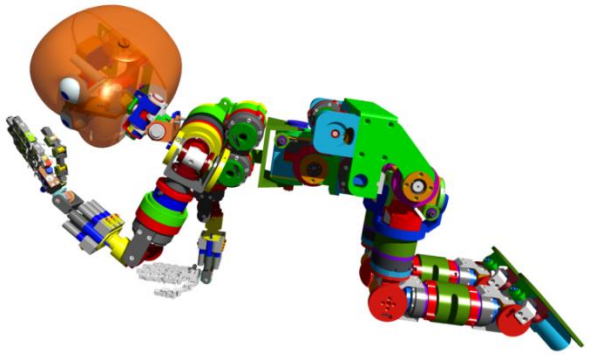
- Module 1: Introduction to robotics- History, growth; Robot applications- Manufacturing industry, defense, rehabilitation, medical etc., Laws of Robotics
- Module 2 : Robot mechanisms; Kinematics- coordinate transformations, DH parameters, Forward kinematics, Inverse Kinematics, Jacobians, Statics
- Module 3: Actuators (electrical)- DC motors, BLDC servo motors; Sensors , sensor integration, Control – PWM, joint motion control, feedback control, computed torque control.
- Module 4: Perception, Localisation and mapping, probabilistic robotics, Path planning

(Basics of Probability Theory: Probability Introduction; Conditional Probability; Bayes Law; Sampling Techniques [1 class];Localization: Kalman Filters; Perception; Sensor Model; Monte-Carlo Localization; Particle Filters; EKF[4 classes];Mapping: Occupancy Grid; Simultaneous Localization and Mapping [2 classes];Path Planning: BFS; DFS; Dijkstra; A-star; D-star; Voronoi; Potential Field; Hybrid approaches [2 classes]);Introduction to Reinforcement Learning

Module 5: Basics of robotic system design

Thank You





ID 6040
Introduction to Robotics

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