



GUJARAT TECHNOLOGICAL UNIVERSITY

# Report on

5 Days' Workshop

## “ELECTRONICS FOR COPTER”

A journey from physics, mathematics, control systems and computer science  
towards controllable flying object

3 - 4 & 10-11-12 April 2015

# CiC3

Community Innovation & Co-Creation Centre

Room No: 128, Gujarat Technological University, ACPC Building,  
L.D. Engineering College Campus,  
Navrangpura, Ahmedabad

## Report

Realizing the growth of embedded systems in day-to-day life and the need for trained manpower in this promising area, Gujarat Technological University's Community Innovation & Co-Creation Centre organized 5 days' workshop on Controllable Flying Objects Electronics for Copter at Conference Hall, Block-6, Gujarat Technological University, L.D. Engineering College Campus, Navrangpura, Ahmedabad on 3-4 & 10-11-12 April 2015 for Copter for Engineers in computers, electronics and IT.

Embedded Systems is a unique field, where engineers need to have sound knowledge in hardware and software design. Keeping this aspect in view, CiC3 has designed the workshop Controllable Flying Objects Electronics for Copter giving equal emphasis to hardware and software, enabling engineers to face challenges in the design and development of state of the art embedded systems for Drones (UAV Unmanned Aerial Vehicles).

Shri Jagdish Sanghani - Electrical/Electronic Manufacturing Professional from UK mentored this workshop. Shri Jagdish Sanghani addressed issues related to hard-ware and software design of embedded sensing devices and applying intelligent control for robots.

### **The workshop has several goals:**

First, it exposed students to the field of embedded systems and provided a knowledge foundation which enabled students to pursue subsequent topic in real-time embedded systems software and computer design. Students became familiar with the associated technical vocabulary and learnt about potential career opportunities in the field of embedded system design.

Second, students had the opportunity to develop an embedded system from the ground up, starting with electronic components and data sheets, and progressing through construction of hardware and implementation of firmware. This provided students with an opportunity to gain a thorough understanding of the phases of embedded system development and familiarity with hardware and software development and debugging tools.

Third, students had been given the opportunity to develop design skills, through well-bounded design assignments as well as open-ended design assignments.

Fourth, students had the opportunity to learn how information gained in multiple other core engineering classes comes together to be applied to real-world design.

## Report

Fifth, students had been given an opportunity to experience embedded system design in a manner similar to that practiced in industry and gained knowledge beneficial for obtaining a job in this field.

The workshop was consisting theory and practical on Arm Cortex M4 based STM32F303-Discovery board and National Instruments LabView. Participants were encouraged to gain some familiarity of integration of various devices like MEM sensors with microcontrollers, Software programming and sensor interfacing & Communication with PC and Discovery board.

This workshop was a hands-on type, giving participants a chance to hear and read about embedded system topics and then put those concepts to work by developing and debugging embedded system hardware and firmware. Participants participated in active discussions of the workshop topics. The workshop grade was based on attendance, participation, lab assignments, quizzes, and teamwork project. Lab assignments were given to participants. The workshop was structured around several key lab assignments.

During the first part (3-4 April 2015) of the workshop, participants focused primarily on basic embedded system concepts, hands on experience with STM32F3-Discovery board, MEMs sensors and supporting circuitry. At the same time, participants became exposed to the STM32F303 instruction set and learnt how to use an assembler, compiler and simulator to develop code.

During the second part (10-11-12 April 2015) of the workshop participants focused more on firmware concepts and developed code in assembly and C to control the basic hardware. In addition, during this period participants added additional hardware elements to their boards and developed the firmware to control this new hardware.

On the final day of the workshop, participants focused on significant projects and proceeded through design, development, documentation and presentation of their work. In order to give participants perspective from multiple viewpoints, discussions on several topics were pursued.

Participants also learned about copter, Line follower robot with PID control algorithm & without PID algorithm, Robotic Arm Edge with 6 degrees of freedom with practical Robo demos which are designed & developed by Shri Jagdish Sanghani.

### Some Photographs of Workshop



### Some Photographs of Workshop

