KANDULA SRINIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING
(AUTONOMOUS)

KADAPA-516003. AP

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

(An ISO 9001-2008 Certified Institution)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VALUE ADDED COURSE

ON

"INTRODUCTION TO DRONE TECHNOLOGY"

Resource Person : Mrs T.Umamaheswari, Assistant Professor, Dept. of ECE,KSRMCE

Course Coordinator: Mrs T.Umamaheswari, Assistant Professor, Dept. of ECE,KSRMCE

Course Co-Coordinator: Mrs K.Divya Lakshmi, Assistant Professor, Dept. of ECE,KSRMCE

Duration: 06/11/2023 to 06/12/2023

K.S.R.M. COLLEGE OF ENGINEERING

(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India– 516 003

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Lr./KSRMCE/ECE/ Value Added course on Introduction to Drone Technology/2023-24/

Date: 01-11-2023

To

The Principal,
K.S.R.M. College of Engineering,
Kadapa.

Respected Sir,

Sub : KSRMCE – (Department of ECE) – Permission to conduct a Value Added course on: "Introduction to Drone Technology" Request for granting permission to conduct -Reg.

Respected Sir,

With reference to the cited, the Department of ECE is planning to conduct a Value Added course on Introduction to Drone Technology for B.Tech III SEM students from 06-11-2023 to 06-12-2023 at the Simulation lab. In this regard, we kindly request you to grant permission to conduct a certificate course. This is submitted for your kind perusal.

Thank you sir,

forwarded to the Principal Sir

Yours Faithfully
Coordinator

(T Umamaheswari)

Permitted
U.S.S. Murty
01/11/2023

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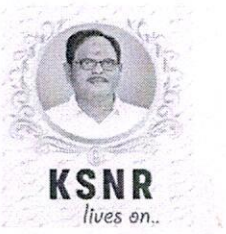

Cr./KSRMCE/ECE/ Value Added course on Introduction to Drone Technology/2023-24/

Date: 02.11.2023

Circular

All the B.Tech III sem students of KSRMCE are hereby informed that the ECE Department is going to organize the Value Added course on "Introduction to Drone Technology" from 06-11-2023 to 06-12-2023 at DSP Lab.

In this connection, all the students who are interested to participate can register by using the following link:https://forms.gle/eBR5543SW1ypYAfy9

Coordinator:
T. Umamaheswari, Assistant Professor, Department of ECE.

Co-Coordinator:
K.Divya Lakshmi, Assistant Professor, Department of ECE.

HoD-ECE
Professor & H.O.D.
Department of E.C.E.
K.S.R.M. College of Engineering
KADAPA - 516 003.

Cc to:

IQAC for information

KSRM COLLEGE OF ENGINEERING(AUTONOMOUS)

Registered list for value added course on Introduction to DroneTechnology

S.No.	NAME OF THE STUDENT	Roll Number	Department	section	MAIL-Id
1	A Uday Kumar Reddy	219Y1A0404	ECE	A	219Y1a0441@ksrmce.ac
2	B.MANASWITHA	219Y1A0406	ECE	A	219Y1A0434@ksrmce ac. In
3	B sai krishna achari	219Y1a0407	Ece	A	219Y1a0418@ksrmce.ac.in
4	Bharath simha reddy	219Y1a0410	ECE	A	219Y1a0418@ksrmce.ac.in
5	B. Naresh	219Y1a0412	ECE	A	219Y1a0448@ksrmce.ac.in
6	B. RAVI KANTH REDDY	219Y1A0414	Ece	A	219Y1a0458@ksrmce.ac.in
7	B.sangeetha	219Y1a0417	ECE/A	A	219Y1a0431@ksrmce.ac.in
8	Botta.kalyani	219Y1A0418	ECE/A	A	219Y1a0431@ksrmce.ac.in
9	Botta.kalyani	219Y1A0418	Ece	B	219Y1a04a8@ksrmce.ac.in
10	Botta.kalyani	219Y1A0418	ECE	B	219Y1a04a8@ksrmce.ac.in
11	Anuhya. C	219Y1A0423	ECE	B	219Y1a0462@ksrmce.ac.in
12	Chavva Rajeshwar reddy	219Y1A0427	ECE	B	219Y1A0473@ksrmce.ac.in
13	Chennuru Karthik Reddy	219Y1A0429	ECE	B	219Y1A0471@ksrmce.ac.in
14	C Rajasekhar naidu	219Y1A0431	ECE	B	219Y1A0489@ksrmce.ac.in
15	C Rajasekhar naidu	219Y1a0431	Ece	B	avinashreddy4486@gmail.com
16	Cv Nagendra Kumar Reddy	219Y1A0432	ECE	B	219Y1a04b4@ksrmce.ac.in
17	C siva pavani	219Y1A0434	Ece	B	219Y1a04b7@ksrmce.ac.in
18	Dasari ganesh	219Y1a0439	Ece	C	219Y1a04d5@gmail.com
19	D.swetha	219Y1a0441	ECE	C	219Y1a04e8@ksrmce.ac.in
20	G. Raghu	219Y1A0448	ECE	C	219y5a0410@ksrmce.ac.in
21	G Nithin kumar reddy	219Y1a0450	ECE	A	219Y1a0406@ksrmce.ac.in
22	G.Nagendra prasad	219Y1a0453	ECE	A	219Y1a0423@ksrmce.ac.in
23	G Guru Prasad	219Y1A0458	Ece	A	219Y1a0410@ksrmce.ac.in
24	G. Hari babu	219Y1A0462	Ece	A	219Y1a0427@ksrmce.ac.in
25	K.Ramya sree	219Y1A0471	ECE	A	219Y1a0450@ksrmce.ac.in
26	K.Bhagya lakshmi	219Y1A0472	Ece	A	219Y1a0428@ksrmce.ac.in
27	K. Deepa Asritha	219Y1A0473	ECE	A	219Y1a0404@ksrmce.ac.in
28	M.Avinash reddy	219Y1A0489	ECE	A	219Y1a0414@ksrmce.ac.in
29	M. Avinash reddy	219Y1A0489	ECE	A	219Y1a0407@ksrmce.ac.in
30	Pandla chandra Sekhar	219Y1a04a8	ECE	A	219Y1a0418@ksrmce.ac.in
31	Pandla Chandra Sekhar	219Y1a04a8	Ece	A	219Y1A0453@ksrm.ac.ce
32	Peram Roja Reddy	219Y1A04B4	Ece	A	219Y1a0417@ksrmce.ac.im
33	Ramireddy gari Bharathi	219Y1a04b7	ECE	B	219Y1A0472@ksrmce.ac.in
34	S siva ruchitha	219Y1a04d5	Ece	A	219Y1a0412@ksrmce.ac.in
35	v harshavardhan	219Y1a04e8	Ece	A	219Y1A0432@ksrmce.ac.in
36	E kiran kumar	219Y5A0404	ECE	A	219Y1a0439@ksrmce.ac.in
37	C Lokesh Yadav	219Y5A0410	Ece	C	219y5a0404@ksrmce.ac.in

Coordinator

HOD

Professor & H.O.D.
Department of E.C.E.
K.S.R.M. College of Engineering
KADAPA - 516 003

Syllabus of Value Added Course
Course Name: Introduction to Drone Technology

UNIT-1:
Definition of drones, History of drones , Classification of drones based on structure- Fixed wing structure,
,Lighter than air systems and Rotary-wing aircraft, Application of drones, Parts of Drone system, System design, Mechanical design, hardware design , software architecture, Logistic and Operations Management.

UNIT-II
Forces of flight, Principal axes and rotation of aerial systems , Longitudinal axis, Lateral(transverse) axis and Perpendicular axis Equilibrium, Stability - Stable system , Unstable system and,Neutrally stable system, Control – Roll, Pitch, Yaw and Throttle

UNIT-III
Sensors- Accelerometer , Barometer,Gyro Sensor, Magnetometer, Distance sensors,Time of Flight (ToF) Sensors, Thermal sensors, Chemical Sensors , Sensor Testing – Test Philosophies and methodologies Test equipment, Performance testing of sensors

UNIT-IV
Glider, Lift, Drag, Airfoil and its type , Incident and decalage angle, Three axis motions (roll, pitch, and yaw) ,Thrust, Aspect ratio and glide ratio , Glide or dive and descent, gliding angle climb,•Center of pressure, Pitching moment , Load factor, Angle of attack, Build our own glider drone

UNIT-V
ESP8266, Downloading and installing APM Planner or Mission Planner, Configuring the quadcopter - Frame type selection, Compass calibration,•Access calibration, Radio calibration, Flight mode calibration and Failsafe calibration, Surveying with a drone, tweaks with the Flight Plan screen Calibration, Future of Drone Systems

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Department of Electronics & Communication Engineering
Value Added Course on Drone Technology (06/11/2023 – 06/12/2023)
Schedule

S.No	Date	Time	Name of the Faculty	Topic
1	6-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Definition of drones • History of drones
2	7-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Classification of drones based on structure- Fixed wing structure,
3	8-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Lighter than air systems and Rotary-wing aircraft
4	9-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Application of drones • Parts of Drone system
5	10-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• software architecture
6	13-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• System design, Mechanical design, hardware design
7	14-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Logistic and Operations Management.
8	15-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Forces of flight • Principal axes and rotation of aerial systems
9	16-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Longitudinal axis, Lateral(transverse) axis and Perpendicular axis • Equilibrium, Stability - Stable system
10	20-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Unstable system and •Neutrally stable system, Control – Roll, Pitch, Yaw and Throttle
11	21-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Sensors- Accelerometer , Barometer,Gyro Sensor, Magnetometer Distance sensors,
12	22-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Time of Flight (ToF) Sensors, Thermal sensors, Chemical Sensors
13	23-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• Sensor Testing – Test Philosophies and methodologies Test equipment, Performance testing of sensors

14	24-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Glider, Lift, Drag, Airfoil and its type , Incident and decalage angle,
15	25-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	Three axis motions (roll, pitch, and yaw)
16	27-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Thrust, Aspect ratio and glide ratio , Glide or dive and descent, gliding angle climb
17	28-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Center of pressure, Pitching moment , Load factor, Angle of attack, Build our own glider drone
18	29-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	• ESP8266, Downloading and installing APM Planner or Mission Planner
19	30-Nov-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Configuring the quadcopter - Frame type selection, Compass calibration
20	1-Dec-2023	03.00 PM to 05.00PM	T.Umamaheswari	•Access calibration, Radio calibration
21	2-Dec-2023	03.00 PM to 05.00PM	T.Umamaheswari	Flight mode calibration and Failsafe calibration
22	4-Dec-2023	03.00 PM to 05.00PM	T.Umamaheswari	Surveying with a drone, tweaks with the Flight Plan screen
23	5-Dec-2023	03.00 PM to 05.00PM	T.Umamaheswari	Calibration
24	6-Dec-2023	03.00 PM to 05.00PM	T.Umamaheswari	Future of Drone Systems

Coordinator

HOD

Professor & H.O.D.
Department of E.C.E.
K.S.R.M. College of Engineering
KADAPA - 516 003

KSRM COLLEGE OF ENGINEERING(AUTONOMOUS)

Attendance for value added course on Introduction to DroneTechnology

S.No.	Roll Number	22/11/2023	23/11/2023	24/11/2023	25/11/2023	27/1/2023	28/11/2023	29/11/2023	30/11/2023	12-01-2023	12-02-2023	12-04-2023	12-05-2023	12-06-2023
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35	219Y1a04e8													
36	219Y5A0404													
37	219Y5A0410													

Coordinator

HOD

Professor & H.O.D.
Department of E.C.E.
K.S.R.M. College of Engineering
KADAPA - 516 003

KSRM COLLEGE OF ENGINEERING(AUTONOMOUS)

Attendance for value added course on Introduction to DroneTechnology

S.No.	Roll Number	11-06-2023	11-07-2023	11-08-2023	11-09-2023	11-10-2023	13/11/2023	14/11/2023	15/11/2023	16/11/2023	17/11/2023	18/11/2023	20/11/2023	21/11/2023
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36	219Y5A0404													
37	219Y5A0410													

Coordinator

HoD

Professor & H.O.D.
Department of E.C.E.
K.S.R.M. College of Engineering
KADAPA - 516 003

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KSNR
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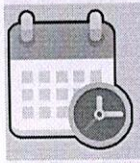
IEEE

DEPARTMENT OF ECE

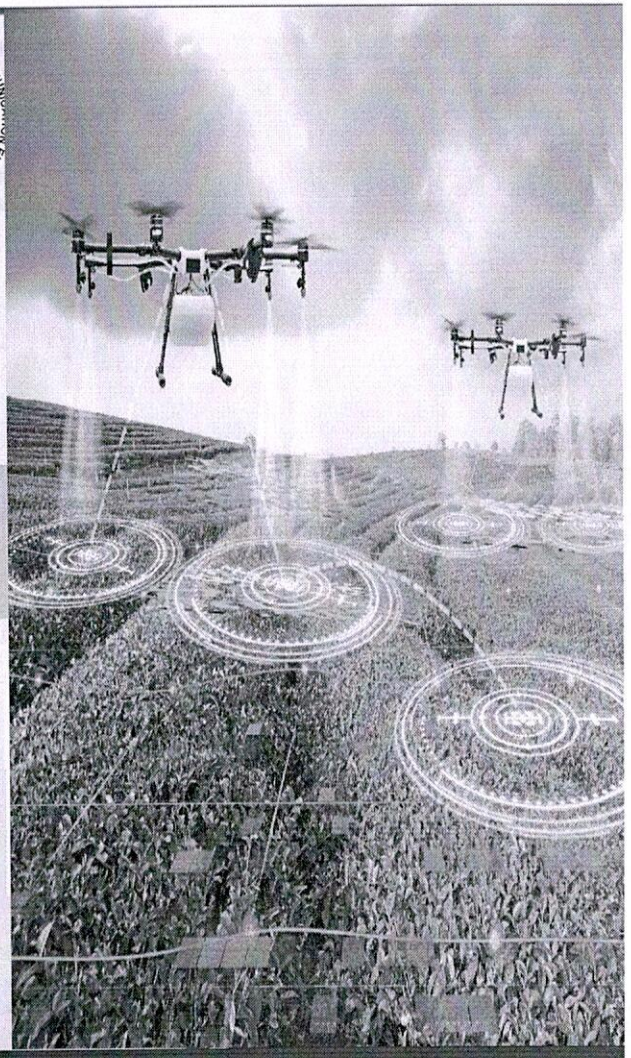
ValueAdded Course on Introduction toDrone Technology

Department of ECE-KSRMCE in association with IETE & IEEE



06-11-2023 to
06-12-2023

SJ DSP LAB



Coordinator

Smt.T.Umamaheswari,
Asst. Prof,Department of ECE

CO-Coordinator

Smt. K.Divya Lakshmi,
Asst. Prof,Department of ECE

Resource persons

Smt.T.Umamaheswari,
Asst. Prof,Department of ECE

https://forms.gle/oPcnkNBrpZ62op469

Dr. G. Hemalatha (HOD)	*Dr. V.S.S. Murthy* (Principal)	*Dr. Kandula Chandra Obul Reddy* (Managing Director)	*Smt. K.Rajeswari* (Correspondent Secretary, Tresurer)	*Sri K. Madan Mohan Reddy* (Vice - Chairman)	*Sri K. Raja Mohan Reddy* (Chairman)

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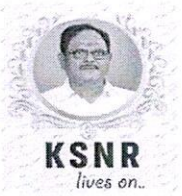


Lr./KSRMCE/ECE/ Certificate course on python for Data Science/2022-23/

ACTIVITY REPORT

Value Added Course

On

"Introduction to Drone Technology"

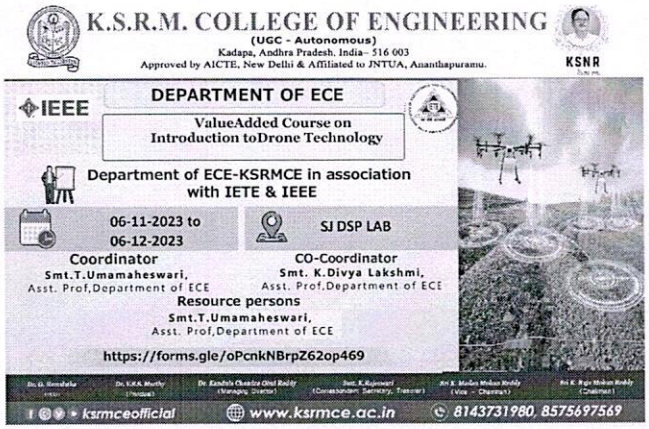
06/11/2023 to 06/12/2023

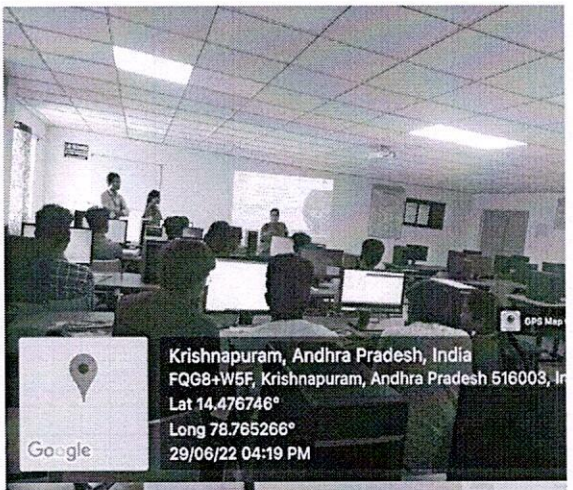
Target Group	:	Students
Details of Participants	:	**27** Students
Coordinators	:	Smt.T.Umamaheswari, Asst. Professor in ECE Dept. Smt.K.Divya lakshmi, Asst. Professor in ECE Dept.
Organizing Department	:	Department of Electronics & Communication Engineering
Venue	:	DSP LAB

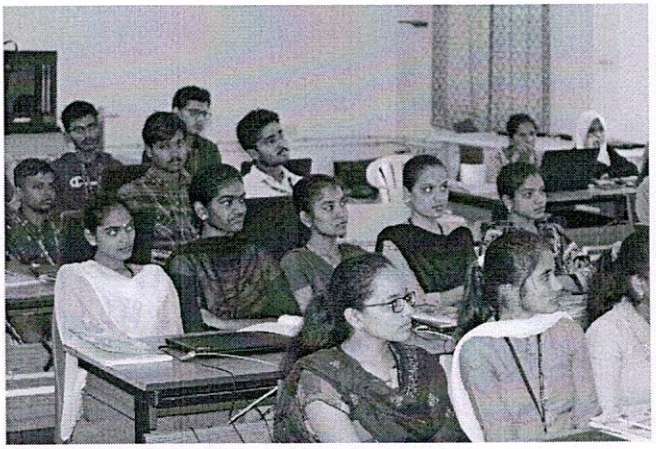
Description:

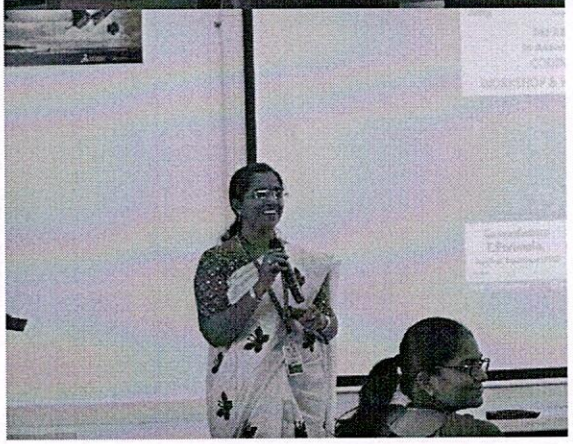
The **"Introduction to Drone Technology"** Value Added course was organized by Dept. of ECE from **06/11/2023 to 06/12/2023** in DSP Lab. Dr. G.HemaLatha, HOD, Dept. of ECE addressed the students initially and Smt.T.Umamaheswari acted as Course instructors. The main aim of the course is to create awareness among students of the fundamental ideas behind automatic pilotless aircraft. Drone technology is the upcoming trend in each corner of the world for many applications. More than Forty Hours course was completed and participation certificates were provided to the participants.

Photo :









Coordinators

HoD-ECE

Professor & H.O.D.
Department of E.C.E.
K.S.R.M. College of Engineering
KADAPA - 516 003

(9)

K.S.R.M. COLLEGE OF ENGINEERING

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21941A0404

Department of Electronics & Communication Engineering

1. What is full form of UAV is universal aerial vehicle
2. Components of Unmanned Aircraft System (UAS) does not consists of _____

a) UAV b) Ground based controller c) Air strip for landing

d) A communication system between UAV and Controller

3.

Which of the following category of drones does not require registration for use in India?

a) Micro Category b) Small Category c) Nano Category d) Large Category

4. Which of the following is not an application of drone?

a)Photogrammetry b) Land Survey c) Population Survey d) Under Water Survey

5. as compare to aircraft or satellite imaginery, drones are beneficial because of _____

A)Fly at lower altitude b) High accuracy data

c) Independent of atmospheric condition d) All of the above

6. Which one of these UAVs is more suitable for ship-to-shore surveillance?

a) Close range UAVs b) Mini-UAVs c) RPHs d) UCAVs

7. Which one of the following is not a primary component of Drone? a) Electronic Speed Controller b) BLDC Motor c) Transmitter d) Receiver

8. _____ are less susceptible to air turbulence compared with fixed-wing aircraft of low wing-loading. a) Rotary Wing UAV b) HALE UAV c) MALE UAV d) NAV

9. Drones aren't allowed to fly above 120m. [T/F]

10. Drones were originally used for agriculture. [T/F]

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Department of Electronics & Communication Engineering

1. What is full form of UAV is Unmanned Aircraft

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8

KSNR

Department of Electronics & Communication Engineering

21A91A04106

1. What is full form of UAV is Universal Aircraft

2. Components of Unmanned Aircraft System (UAS) does not consists of _____

a) UAV b) Ground based controller c) Air strip for landing

d) A communication system between UAV and Controller

3.

Which of the following category of drones does not require registration for use in India?

a) Micro Category b) Small Category c) Nano Category d) Large Category

4. Which of the following is not an application of drone?

a)Photogrammetry b) Land Survey c) Population Survey d) Under Water Survey

5. as compare to aircraft or satellite imaginery, drones are beneficial because of _____

A)Fly at lower altitude b) High accuracy data

c) Independent of atmospheric condition d) All of the above

6. Which one of these UAVs is more suitable for ship-to-shore surveillance?

a) Close range UAVs b) Mini-UAVs c) RPHs d) UCAVs

7. Which one of the following is not a primary component of Drone? a) Electronic Speed Controller b) BLDC Motor c) Transmitter d) Receiver

8. _____ are less susceptible to air turbulence compared with fixed-wing aircraft of low wing-loading. a) Rotary Wing UAV b) HALE UAV c) MALE UAV d) NAV

9. Drones aren't allowed to fly above 120m. [T/F]

10. Drones were originally used for agriculture. [T/F]

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7

4.31

Department of Electronics & Communication Engineering

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Department of Electronics & Communication Engineering

21A91A04123

1. What is full form of UAV is Universal Aircraft

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DEPARTMENT OF ELECTRONICS AND COMMINICATION ENGINEERING

VALUE ADDED/CERTIFICATE COURSE ON

DRONE TECHNOLOGY FROM 06/11/2023 TO 06/12/2023

AWARD LIST

S.No	Roll Number	Name of the Student	Marks Obtained
1.	219Y1A0404	A Uday Kumar Reddy	9
2.	219Y1A0406	B.MANASWITHA	8
3.	219Y1a0407	B sai krishna achari	8
4.	219Y1a0410	Bharath simha reddy	9
5.	219Y1A0414	B. RAVI KANTH REDDY	7
6.	219Y1a0417	B.sangeetha	8
7.	219Y1A0418	Botta.kalyani	8
8.	219Y1A0423	Anuhya. C	8
9.	219Y1A0427	Chavva Rajeshwar reddy	7
10.	219Y1A0429	Chennuru Karthik Reddy	7
11.	219Y1A0431	C Rajasekhar naidu	7
12.	219Y1A0434	C siva pavani	9
13.	219Y1a0441	D.swetha	9
14.	219Y1A0448	G. Raghu	7
15.	219Y1a0450	G Nithin kumar reddy	8
16.	219Y1a0453	G.Nagendra prasad	9
17.	219Y1A0458	G Guru Prasad	9
18.	219Y1A0462	G. Hari babu	9
19.	219Y1A0471	K.Ramya sree	7
20.	219Y1A0473	K. Deepa Asritha	8
21.	219Y1A0489	M.Avinash reddy	9
22.	219Y1a04a8	Pandla Chandra Sekhar	9
23.	219Y1A04B4	Peram Roja Reddy	9

24.	219Y1a04b7	Ramireddy gari Bharathi	8
25.	219Y1a04d5	S siva ruchitha	9
26.	219Y1a04e8	v harshavardhan	9
27.	229Y5A0410	C Lokesh Yadav	7

Coordinator

HoD

Professor & H.O.D.
Department of E.C.E.
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G. Hemalatha

Dr. G. Hemalatha
HOD, ECE

V. S. S. Murthy

Prof V S S Murthy
Principal

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G. H

Dr. G. Hemalatha
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V. S. S. Murthy

Prof V S S Murthy
Principal

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G. Hemalatha

Dr. G. Hemalatha
HOD, ECE

V.S.S. Murthy

Prof V S S Murthy
Principal

feedback form of Introduction to Drone Technology

* Indicates required question

1. Roll Number *

2. Name of the Student *

3. Organization of Course and session planning by instructor. *

Mark only one oval.

- Excellent
- Very good
- Good
- Fair
- Poor

4. Clarity in content delivery. *

Mark only one oval.

- Excellent
- Very good
- Good
- Fair
- Poor

5. Content is relevant and useful *

Mark only one oval.

- ◯ Excellent
- ◯ Very good
- ◯ Good
- ◯ Fair
- ◯ Poor

6. Adequate opportunity to interact with trainer *

Mark only one oval.

- ◯ Excellent
- ◯ Very good
- ◯ Good
- ◯ Fair
- ◯ Poor

7. Overall rating

Mark only one oval.

- ◯ Excellent
- ◯ Very good
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Department of Elelctronics & Communication Engineering

Feed back of Value Added Course on Introduction to Drone Technology

S.no.	Roll Number	Name of the Student	Organization of Course and session planning by instructor.	Clarity in content delivery.	Content is relevant and useful	Adequate opportunity to interact with trainer	Overall rating
1	219Y1A0404	A Uday Kumar Reddy	Good	Very good	Good	Good	Good
2	219Y1A0406	B.MANASWITHA	Excellent	Excellent	Excellent	Excellent	Excellent
3	219Y1a0407	B sai krishna achari	Excellent	Excellent	Excellent	Excellent	Excellent
4	219Y1a0410	Bharath simha reddy	Excellent	Very good	Excellent	Excellent	Excellent
5	219Y1A0414	B. RAVI KANTH REDDY	Very good	Fair	Very good	Very good	Very good
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11	219Y1A0431	C Rajasekhar naidu	Very good	Very good	Very good	Very good	Very good
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25	219Y1a04d5	S siva ruchitha	Very good	Very good	Very good	Very good	Very good
26	219Y1a04e8	v harshavardhan	Very good	Very good	Very good	Very good	Very good
27	219Y5A0410	C Lokesh Yadav	Very good	Excellent	Excellent	Excellent	Excellent

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Unit I - INTRODUCTION TO DRONE

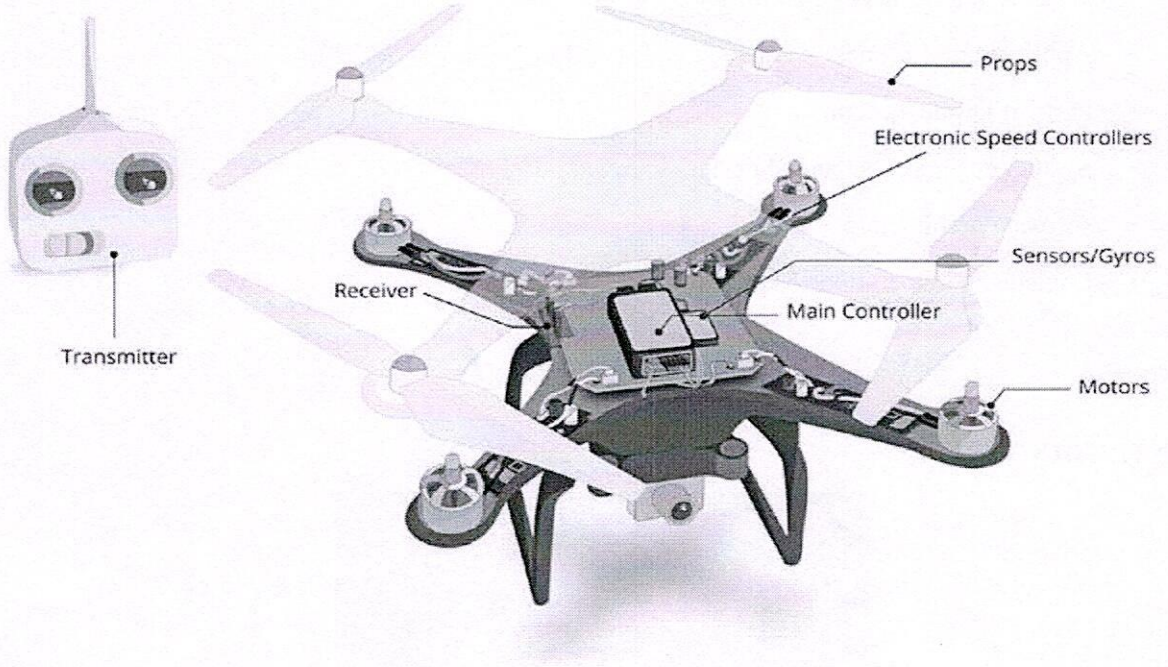
- Definition of drones
- History of drones
- Classification of drones based on structure- Fixed wing structure, Lighter than air systems and Rotary-wing aircraft
- Application of drones
- Parts of Drone system
- System design, Mechanical design, hardware design
- software architecture
- Logistic and Operations Management.

INTRODUCTION:

- An unmanned aerial vehicle (UAV) or uncrewed aerial vehicle commonly known as a drone, is an aircraft without any human pilot, crew or passengers on board.
- UAVs are a component of an unmanned aircraft system (UAS), which include additionally a ground-based controller and a system of communications with the UAV.
- The flight of UAVs may operate under remote control by a human operator, as remotely-piloted aircraft (RPA), or with various degrees of autonomy, such as autopilot assistance, up to fully autonomous aircraft that have no provision for human intervention.
- UAVs were originally developed through the twentieth century for military missions

- As control technologies improved and costs fall, their use in the twenty-first century is rapidly finding many more applications including aerial photography, product deliveries, agriculture, policing and surveillance, infrastructure inspections.

PARTS OF A DRONE



KEY PARTS

- From an engineer's view, the key parts of a drone system are the hardware, software, and mechanical elements;
- and a perfect balance between the three provides a flawless system design.

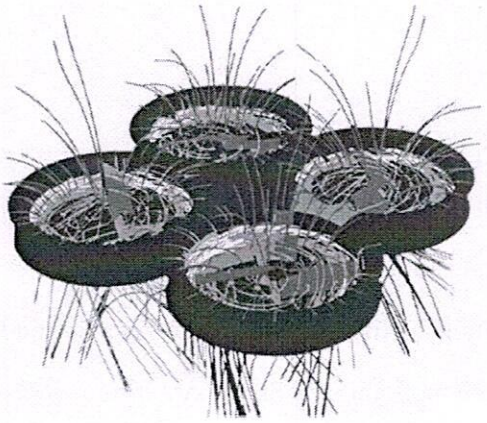
HARDWARE

- Hardware is the electrical part of the drone system, which is eventually a PCBA (printed circuit board assembly).
- Hardware is a multilayer PCB that accommodates the SOC (system on a chip) and different
- components of the subsystems interconnected through copper traces (part of the PCB) or physical wires. Figure shows the PCBA assembled with SOC and subsystems on the top side (primary side).

UNIT 2: DYNAMICS AND STABILITY

- Forces of flight
- Principal axes and rotation of aerial systems
- Longitudinal axis, Lateral(transverse) axis and Perpendicular axis
- Equilibrium, Stability - Stable system
- Unstable system and
- Neutrally stable system, Control –Roll, Pitch, Yaw and Throttle

- The physics for flying a drone is really necessary to be known by all the
- drone pilots because, if you cannot master the air, your drone will not fly properly. how air is affected by the propellers of the drone.
- The figure is taken from the NASA website. They simulated the aerodynamics via computers:



INTRODUCTION

- So, basically a drone (specially quadcopters) has two pairs of propellers (two in a clockwise direction and another two in a anticlockwise direction).
- The speed of each motor is individually controlled to control the movement of the drone.
- We need to think about two things for flying a drone, the torque, and the thrust. Well, a torque is nothing but a twisting force that tends to cause rotation.
- Alternatively, we can say, in physics, the capability of rotating an object around a fixed axis is known as torque. It is symbolized as (Tau). Mathematically, torque is the vector product of force (F) and the distance (r) of the axis.

DEFINITION

$$\vec{\tau} = \vec{F} \times \vec{r}$$

(OR)

$$\tau = Fr\sin\theta$$

UNIT III SENSORS IN DRONE

Sensors – Accelerometer, Barometer

Gyro Sensor, Magnetometer

Distance sensors, Time of Flight (ToF) Sensors

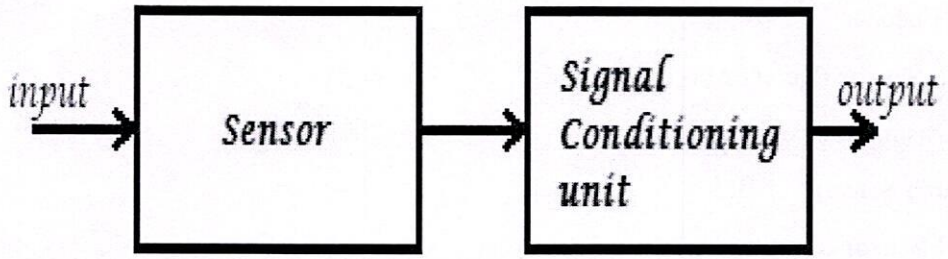
Thermal sensors, Chemical Sensors and

Sensor Testing – Test Philosophies and methodologies

Test equipment, Performance testing of sensors

SENSORS IN DRONE

- The sensor can be defined as a device which can be used to sense/detect the physical quantity like force, pressure, strain, light etc and then convert it into desired output like the electrical signal to measure the applied physical quantity. In few cases, a sensor alone may not be sufficient to analyze the obtained signal. In those cases, a signal conditioning unit is used in order to maintain sensor's output voltage levels in the desired range with respect to the end device that we use.



SIGNAL CONDITIONING UNIT

- In **signal conditioning unit**, the output of the sensor may be amplified, filtered or modified to the desired output voltage. For example, if we consider a microphone, it detects the audio signal and converts to the output voltage (is in terms of millivolts)

which becomes hard to drive an output circuit. So, a signal conditioning unit (an amplifier) is used to increase the signal strength. But the signal conditioning may not be necessary for all the sensors like photodiode, LDR etc.

- Most of the sensors can't work independently. So, sufficient input voltage should be applied to it. Various sensors have different operating ranges which should be considered while working with it else the sensor may get damaged permanently.

TYPES OF SENSORS

- The various different types of sensors that are available in the market and discuss their **functionality, working, applications** etc.

- **Light Sensor**
  - IR Sensor (IR Transmitter / IR LED)
  - Photodiode (IR Receiver)
  - Light Dependent Resistor
- **Temperature Sensor**
  - Thermistor
  - Thermocouple

- **Pressure/Force/Weight Sensor**
  Strain Gauge (Pressure Sensor)

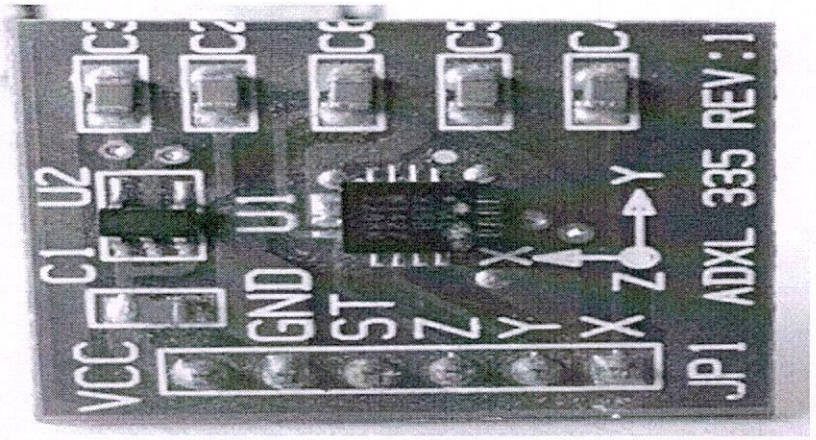
  Load Cells (Weight Sensor)

  Position Sensor
  Potentiometer

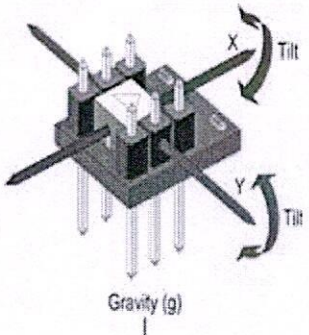
  Encoder
- **Hall Sensor (Detect Magnetic Field)**
- **Ultrasonic Sensor**
- **Touch Sensor**
- **PIR Sensor**
- **Tilt Sensor**
  Accelerometer
- **Gas Sensor**
- We need to select the desired sensor based on our project or application. In order to make them work, proper voltage should be applied based on their specifications.

ACCELEROMETER (TILT SENSOR)

- **An accelerometer sensor** ***can sense the tilt or movement of it in a particular direction.*** It works based on the acceleration force caused due to the earth's gravity.
- The tiny internal parts of it are such sensitive that those will react to a small external change in position. It has a piezoelectric crystal when tilted causes disturbance in the crystal and generates potential which determines the exact position with respect to X, Y and Z axis.

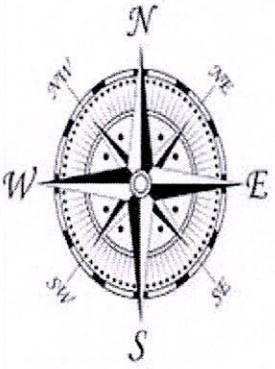


DRONE STABILIZATION



Accelerometer

Gyroscope



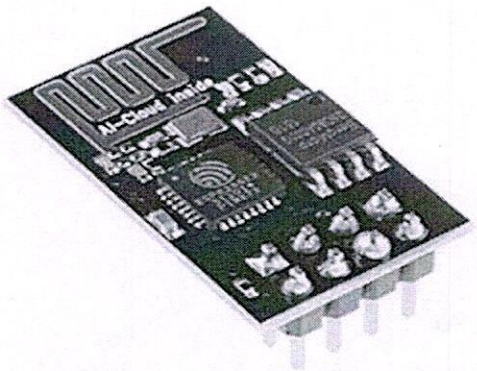
Compass

UNIT 5
DRONES FOR MISSION CONTROL APPLICATION

ESP8266, Downloading and installing APM Planner or Mission Planner, Configuring the quadcopter - Frame type selection, Compass calibration, Access calibration, Radio calibration, Flight mode calibration and Failsafe calibration, Surveying with a drone, tweaks with the Flight Plan screen. Future of Drone Systems

ESP8266:

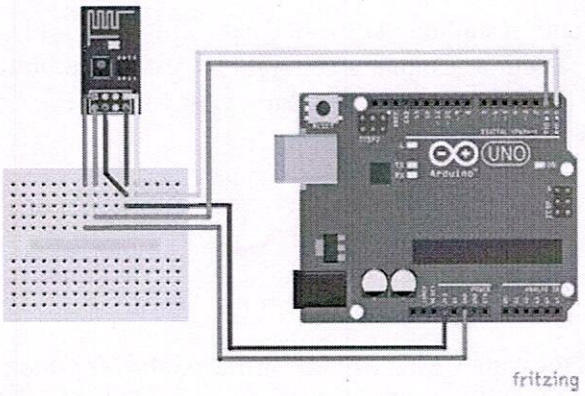
The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing the building of single-chip devices capable of connecting to Wi-Fi. These microcontroller chips have been succeeded by the ESP32 family of devices, including the ESP32-C3. The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability.



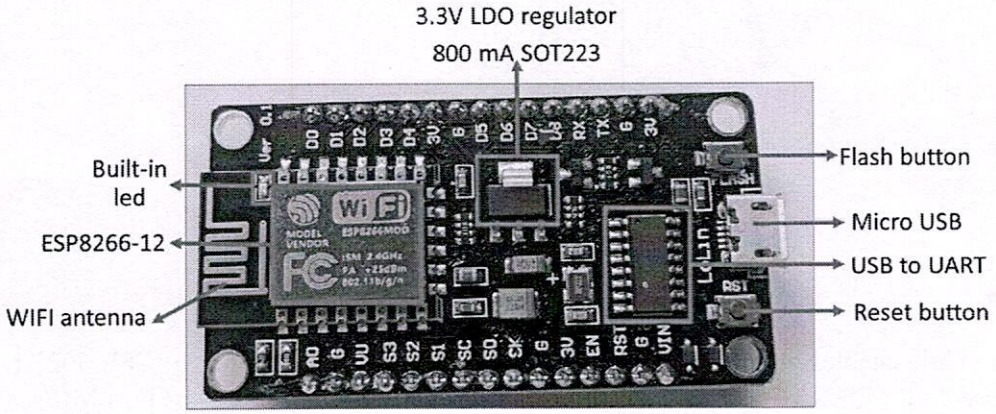
The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn. It can be used with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or it can be used as a self-sufficient MCU by running an RTOS-based SDK.

The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the amazing thing is that this little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language.

An ESP8266 is a microcontroller: Low-power, highly-integrated Wi-Fi solution. A minimum of 7 external components. Temperature range: -40°C to +125°C.



The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor.



DOWNLOADING AND INSTALLING APM PLANNER OR MISSION PLANNER:

APM Planner is a merge between the Mission Planner functionality and look and feel (Windows only) with the Q Ground Control cross-platform (Mac/Windows/Linux) QT-based architecture, which has better support for multi-vehicle (swarming) control and a plug-in model that is easier to extend.

Downloading:

Just open your browser, find the APK file you want to download, and tap it – you should then be able to see it downloading on the top bar of your device. Once it's downloaded, open Downloads, tap on the APK file, and tap Yes when prompted. The app will begin installing on your device.

Installing APM Planner for Windows:

1.Run .exe file. Open the .exe file to run the installation wizard. Read the open-source license agreement, and select Accept. ...

2.Select options. Choose your installation options. ...

3.Close wizard to complete installation. Select Close to exist the wizard.

SYSTEM REQUIREMENTS:
Windows 7 or later

.NET

300 MB free space

Internet connection to use maps

Download
Download the insatller (XXX_win.exe) file for your machine from

firmware.ardupilot.org/Tools/APMPlanner

And also check the discussion forum for lastest info

https://discuss.ardupilot.org/c/ground-control-software/apm-planner-2-0

Run .exe file
Open the .exe file to run the installation wizard. Read the open-source license agreement, and select Accept. Select a destination folder for the installation (the default option is fine if you aren't sure).