

Department of Electronics

Revised Syllabus of Advanced Diploma- II Program

(2021-22)

❖ **Title of Program:** Internet of Things

❖ **Syllabus Structure (PG)**

Year	Semester	Course No.	Course Code	Contact Hours	Credits (1Credit=15 H)	Total Marks	
2	III	CT III	AD E T 303	30	2	75	
		CL III	AD E L303	60	2	150	
	IV	CT IV	AD E T 404	30	2	75	
		CL IV	AD E L404	60	2	150	
	Annual	CP II	AD E P202	60	2	150	
	Industrial and or Incubation and or Research and or Field Training				60	2	-
	Total				270	12	600
Total				510	22	1200	

AD: Advanced Diploma, E: Electronics C: Course, T: Theory, L: Lab (Practical), P: Project

Total No. of Papers: 06 (Theory: 02, Practical: 02, Project: 01)

Theory and Practical: Semester, Project: Annual

❖ **Evaluation Structure**

Year	Semester	Theory (75 per Semester) (Marks = 150 per year)					Practical (150 per Semester) (Marks = 300 per year)						Project (Annual) (Marks = 150 per year)				Total Marks			
		Course No.	Course Code	Internal (35) Assessment		DESE (40)	Total	Course No.	Course Code	Internal (70) Assessment		DESE (80)		Course No.	Course Code	Presentation + Viva-Voce/Oral		Project Report	Total	
				DESE	Attendance					Lab Work	Attendance	Exam	Lab Work Book							
I	I	CT I	AD*T 101	30	5	40	75	CL I	AD*L 101	50	20	60	20	150	CP I	AD* P101	75	75	150	600
	II	CT II	AD*T 202	30	5	40	75	CL II	AD*L 202	50	20	60	20	150						
	Total		60	10	80	150	Total		100	40	120	40	300	Total						
II	III	CT III	AD*T 303	30	5	40	75	CL III	AD*L 303	50	20	60	20	150	CP II	AD* P 202	75	75	150	600
	IV	CT IV	AD*T 404	30	5	40	75	CL IV	AD*L 404	50	20	60	20	150						
	Total		60	10	80	150	Total		100	40	120	40	40	Total						
Total of Two Years		120	160	20	300	Total		200	80	240	80	600	Total		150	150	300	1200		

AD: Advanced Diploma, *: Departmental Code (C: Chemistry, MI: Microbiology, CSE: Computer Science (Entire), etc)

C: Course, T: Theory, L: Lab (Practical), P: Project

Theory and Practical: Semester, Project: Annual

ADISE I and II: AdvancedDiploma Internal Semester Examination (online) for I and II Semester

ADESE I and II: AdvancedDiploma End Semester Examination for I and II Semester

Advanced Diploma Programme: Total Marks per Year: 150 (Theory) + 300 (Practical) +150 (Project) = 600

Semester III**CT-III: DET 303: Title: Arduino Programming and Real world Interfacing Techniques****(Contact Hrs: 30 Credits: 2)****Learning Objectives:**

1. To Provide Conceptual Knowledge of Arduino development board.
2. To familiarize with sensors, actuators and Develop interfacing techniques.

Unit I: Introduction to Arduino (15)

Integrated Development Environment (IDE) for ARDUINO microcontrollers, free IDEs like ARDUINO Studio, Installing and configuring for Robot programming, In System Programmer (ISP) Developing first sketch in Arduino, simulating sketch, Debugging of sketch, loading programmers on Arduino board, Testing to toggle LED on Arduino board.

Unit II: Sensors, Actuators and Interfacing Techniques (15)

Sensors: IR range sensor of different range, Analog IR proximity sensors, Position encoders, Ultrasound scanner, Gyroscope and Accelerometer, Magnetometer, GPS receiver.

Actuators: DC Motors, Servo Motors, Stepper motors, Motor Control and its implementations, LCD interfacing with the robot (2 x 16 Characters LCD).

Timer/Counter operations: PWM generation, Motor velocity control, Servo control, velocity calculation and motor position Control, event scheduling.

Communication: Wired RS232 (serial) Communication, Wireless ZigBee Communication, USB Communication, Introduction to Node Red, Visual Prototyping with Arduino and connectivity to IOT platforms.

Learning Outcomes:

After completion of the unit, Student is able to

- 1) Explain systems using Arduino boards.
- 2) Understand Sensors, Actuators and Interfacing Techniques.

Reference Books:

1. “ Arduino Programming in 24 Hours, Sams Teach Yourself ” Blum Richard , 5th Edition, 2017
2. “Programming Arduino Programming Arduino: Getting Started with Sketches”, Simon Monk , 2nd Edition, 2016.
3. “Getting Started with Arduino”, Massimo Banzi and Micheal Shiloh 3rd Edition, 2014
4. “Power Electronics Circuits, Devices and Applications”, M.H. Rashid, 3rd Edition, 2003
5. “Measurement, Instrumentation, and Sensors Handbook”, John G. Webster, CRC Press, 1999
6. Practical design of power supplies” , Ron Lenk, John Wiley & Sons, 2005, ISBN: 978-0-08- 097138-4

**CL-III: DEL303: Title: Arduino Programming and Real world Interfacing
Techniques
(Contact Hrs: 60 Credits: 02)**

Learning Objectives:

Students will be able to

1. To learn Arduino development board.
2. To study sensors and actuators.
3. To study various circuits and connect them to the Arduino
4. To learn the interfacing techniques.

List of Practical's

1. To study the different types of arduino boards.
2. To study arduino Integrated Development Environment (IDE).
3. Interfacing of LEDs with arduino.
4. Interfacing IR Sensor of different range with arduino.
5. Interfacing ultrasonic sensor with arduino.
6. Battery voltage sensing and Current Sensing using Arduino.
7. Interfacing of DC Motors White line sensors.
8. DHT11 interfacing with arduino.
9. Interfacing PIR Sensor with arduino.
10. Interfacing of Servo Motors and Stepper motors, Motor Control and its implementations.
11. Bluetooth module interfacing with arduino.
12. ZigBee module interfacing with arduino.
13. Interfacing of LCD.
14. Interfacing of Micro SD Card.
15. To develop IoT system for various applications (Like Smart Homes, Industries etc.).

Learning Outcomes:

After completion of the unit, Student is able to

1. Develop systems using Arduino boards
2. Interface Sensors and Actuators
3. Prototype circuits and connect them to the Arduino
4. Develop systems using interfacing Techniques.

Reference Books:

1. “ Arduino Programming in 24 Hours, Sams Teach Yourself ” Blum Richard , 5th Edition, 2017
2. “Programming Arduino Programming Arduino: Getting Started with Sketches”, Simon Monk , 2nd Edition, 2016.
3. “Getting Started with Arduino”, Massimo Banzi and Micheal Shiloh 3rd Edition, 2014
4. “Power Electronics Circuits, Devices and Applications”, M.H. Rashid, 3rd Edition, 2003
5. “Measurement, Instrumentation, and Sensors Handbook”, John G. Webster, CRC Press, 1999
6. Practical design of power supplies” , Ron Lenk, John Wiley & Sons, 2005, ISBN: 978-0-08- 097138-4

Semester IV

CT-IV: DET 404: Title: Introduction to Python Programming and IOT Boards (Contact Hrs: 30 Credits: 2)

Learning Objectives:

1. To Provide Factual Knowledge about python programming concepts.
2. To Familiarize with advanced IoT boards.

Unit I: Introduction to Python Programming (16)

Structure of a Python Program, Elements of Python, Python Interpreter, Using Python as calculator, Python shell, Indentation, Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

Creating Python Programs: Input and Output Statements, Control statements (Looping while Loop, for Loop, Loop Control, Conditional Statement- if...else, Difference between break, continue and pass) **Structures:** Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments

HTML Programming: What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags. Creating Web Page.

Cloud Computing: General Benefits and Architecture, Business Drivers, Main players in the Field, Overview of Security Issues, XaaS Cloud Based Service Offerings

Unit II: Study of Advanced IoT Boards (14)

Raspberry Pi, Node MCU etc., Native vs. Cross Building Applications, Supporting Libraries, Peripheral Management on Linux (UART, GPIO, ADC, SPI, I2C, etc) Wearable, industrial standards, Open Data Management & API.

Case studies: Connected use cases in Real-life/Thematic areas – Smart Homes/Buildings, Smart Cities, Smart Industry, Smart Medical care, Smart Automation etc.

Learning Outcomes:

After completion of the unit, Student is able to

1. Illustrate python programs
2. Explain advanced IoT boards for applications

Reference Books:

1. “Exploring Python”, T. Budd, 1st Edition, 2011
2. “How to think like a computer scientist: learning with Python”, Allen Downey, Jeffrey Elkner, Chris Meyers, Freely available online.2012
3. “Programming the Raspberry Pi: Getting Started with Python”, Simon Monk, 2nd Edition, 2015.
4. “Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux”, Derek Molloy, 1st Edition, Wiley, 2016
5. “Learning Python with Raspberry Pi”, Alex Bradbury, Ben Everard, 1st Edition, Wiley, 2014
6. “Getting Started with Python and Raspberry Pi”, Dan Nixon, 1st Edition, 2015
7. “HTML & CSS: The Complete Reference”, Powell Thomas , 5th Edition,2010
8. “Mastering HTML, CSS & Javascript Web Publishing” , Laura Lemay , Rafe Colburn , Jennifer Kyrnin , 2016 .

CL-IV:DEL404: Title (Practical): Introduction to Python Programming and IOT Boards Lab
(Contact Hrs: 60 Credits: 02)

Learning Objectives:

Students will be able to

1. To study python programming concepts.
2. To study design web page using html.
3. To study design and program Raspberry Pi applications.
4. To study of advanced IoT boards.

List of Practical's

1. To study the arithmetic operations of python
2. Program to:
 - a. Read n integers and display them as a histogram.
 - b. Display sine, cosine, polynomial and exponential curves.
 - c. Plot a graph of people with pulse rate p vs. height h. The values of P and H are to be entered by the user.
3. Write a menu-driven program to create mathematical 3D objects:
 - 1) Curve 2) Sphere 3) Cone 4) Arrow 5) Ring 6) Cylinder
4. To study introduction to HTML
5. To study interesting images through image tags.
6. To design web page for controlling devices
7. To study the architecture of application board of Raspberry Pi.
8. To demonstration the OS (Debian) for RPi in a SD card preparation
9. Configuration of Raspberry Pi during first booting and use of remote SSH like putty
10. To demonstrate the basic linux commands on Raspberry pi. 18-20
11. To create a database & Store the value in Raspberry Pi.
12. To install Android on Raspberry Pi
13. To Setup RPi first time without using screen, mouse, keyboard.
14. To interface ADC at GPIOs of Raspberry Pi for measuring analog voltage.
15. Interface wifi module with IoT board to toggle LEDs and control relays.

Learning Outcomes:

After completion of the unit, Student is able to

1. Develop python programs and structures.
2. Use advanced IoT boards for applications.
3. Learn how to design and program Raspberry Pi applications.
4. Learn how to build real world creative and modern website.

Reference Books:

1. “Exploring Python”, T. Budd, 1st Edition, 2011
2. “How to think like a computer scientist: learning with Python”, Allen Downey, Jeffrey Elkner, Chris Meyers, Freely available online.2012
3. “Programming the Raspberry Pi: Getting Started with Python”, Simon Monk, 2nd Edition, 2015.
4. “Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux”, Derek Molloy, 1st Edition, Wiley, 2016
5. “Learning Python with Raspberry Pi”, Alex Bradbury, Ben Everard, 1st Edition, Wiley, 2014
6. “Getting Started with Python and Raspberry Pi”, Dan Nixon, 1st Edition, 2015
7. “HTML & CSS: The Complete Reference”, Powell Thomas , 5th Edition,2010
8. “Mastering HTML, CSS & Javascript Web Publishing” , Laura Lemay , Rafe Colburn , Jennifer Kyrnin , 2016 .

CP-II: DEP202: Project
(Contact Hrs. 60, Credits: 2)

Every student should take up a project & submit in the report the work he/she has carried out. The project work will be assessed independently at the time of practical examination