|| सा विद्या या विमुक्तये ||

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542
Fax : (02462) 229574
Website: www.srtmun.ac.in
E-mail: bos.srtmun@gmail.com

विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०–२१ पासून मान्यता दिलेल्या व्होकेशनल कोर्सेसचे (बी.व्होक पदवी, ॲडव्हॉस डिप्लोमा, डिप्लोमा व सर्टिफिकेट) अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करणे बाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०–२१ पासून मान्यता दिलेल्या व्होकेशनल कोर्सेसच्या (बी. व्होक पदवी, ॲडव्हान्स डिप्लोमा, डिप्लोमा व सर्टिफिकेटस) अभ्यासक्रमांना मा विज्ञान व तंत्रज्ञान विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व मा. विद्यापरिषदेच्या दिनांक १२ जून २०२१ रोजीच्या बैठकीतील विषय क्रमांक २६/५१–२०२१ च्या** ठरावानुसार खालील अभ्यासक्रमांस मान्यता देण्यात आली आहे व त्यानुसार दिनांक ०५/०७/२०२१ रोजी प्रसिध्द करण्यात आलेल्या परीपत्रकातील अभ्यासक्रमाच्या नावामध्ये (Nomenclature) काही टायपोग्राफिक चुका असल्यामुळे त्या दुरूस्ती करून सदर परिपत्रक नव्याने प्रसिध्द करण्यात येत आहे. याची सर्वांनी नोंद घेवून यापूर्वीचे परिपत्रक क्रमांक जा.क्र. :शैक्षणिक–१/परिपत्रक/व्होकेशनल अभ्यासक्रम/N-२०२०–२१/६८ रद्द समजण्यात यावे.

1. B. Voc. IT/Hardware and Networking.
2. B. Voc Software Development.
3. B. Voc. Bachelor of Medical Laboratory Technology.
4. B. Voc. Horticulture and Post-Harvest Technology.
5. B. Voc. Herbal Medicine.
6. B. Voc. Agriculture/Commercial Aquaculture.
7. B. Voc. Food Processing/Food Processing Technology./Food Processing and Technology.
8. B. Voc. Life Sciences/Skill Based Zoology.
9. B. Voc. Vocational Biotechnology.
10. B. Voc. Plant Tissue Culture Technology.
11. Advance Diploma Healthcare/ Radiological Physics.
12. Diploma – Computer Hardware.
13. Diploma – Computer Network Assistant Banking Insurance.
14. P.G. Diploma in Medical Laboratory Technology.
15. P.G. Diploma in Electronics/ Embedded System Design.
16. Diploma in Agriculture/Biofertilizer.
17. Diploma in Fisheries and Farm Management.
18. Diploma in Agriculture/Bee Keeping/Apiculture Technology-

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी. ही विनंती.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

जा.क्र.:शैक्षणिक–१/परिपत्रक/व्होकेशनल अभ्यासक्रम/N-२०२१–२२/**१५०**

दिनांक : ०४.१०.२०२१

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'B++' Grade)

UGC Sanctioned Vocational Course

Syllabus For

PG Diploma in Electronics / Embedded System Design

(CBCS Pattern)

(1 year)

Faculty: Science and Technology

(w.e.f. 2020-21)

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus of PG Diploma in Electronics / Embedded System Design

The Board of Studies in Electronics and System Design, S. R. T. M. University, Nanded is as follows

1.	**Dr. M.B. Swami** **Chairman BOS** Maharashtra Udayagiri Mahavidyalaya, Udgir Dist Latur 413517.	9423351320 zungaswami@gmail.com
2	**Dr. Prakash Bhaskarrao Khanale,** DSM's College of Arts, Commerce & Science, Parbhani - 431 401.	9422176740 prakashkhanale@gmail.com
3	**Dr. P. D. Achole,** Adarsh Education Society's Art, Commerce, Science College, Hingoli - 431513	9850854374 pradeep.achole@yahoo.co.in,
4	**Dr Yogesh Joshi,** L.B.S. Mahavidyalaya, Dharmabad Dist Nanded.	9405362172 yjosh@rediffmail.com
5	**Mr. Nikhil Udaysinh Jadhav,** Sr Software Engineer, KPIT Technology.	9922642112 nikhilujadhav@gmail.com,
	Invitee – Member	
6	**Dr. P. R. Mirkute** Yeshwant College, Nanded.	9420846627 prmelec2019@gmail.com
7	**Mr. M.A. Joshi** Science College Nanded.	9420416085 majoshi.scn@gmail.com

TITLE OF THE PROGRAMME

PG Diploma in Electronics / Embedded System Design

1. Preamble:

Skills and knowledge are the driving forces of economic growth and social development for any country. Presently, the country faces a demand – supply mismatch, as the economy needs more 'skilled' workforce than that is available. In the higher education sphere, knowledge and skills are required for diverse forms of employment in the sectors of education, health care, manufacturing and other services.

Government of India and MEITY taking note of the requirement for skill development among students, launched National Vocational Education Qualification Framework (NVEQF) which was later on assimilated into National Skills Qualifications Framework (NSQF). Various Sector Skill Councils (SSCs) are developing Qualification Packs (QPs), National Occupational Standards (NOSs) and assessment mechanisms in their respective domains, in alignment with the needs of the industry.

In view of this our University initiated to start skill based courses which are in demand of industries to be carry responsibilities of society. The programme is highly relevant for all those who want to pursue a professional career in Embedded development.

1. Aim: To mitigate the needs of Electronics Embedded Skills among the students and fill the need of future industry .

Objective:

- To make student aware about embedded systems and its design flow
- To give the hands on training on different platforms of embedded system design
- **Eligibility and Fees**
- B.E. / B.Tech. / MCA / BCA / M.Sc. (IT / CS / Elect), B.Sc. (CS),B.Sc. (Electronics)

2. Program outcome:

Students will be awarded:

PG Diploma:	Student shall be required to appear in examinations of all courses. However, to award the Diploma (PG Diploma in Electronics / Embedded System Design) a student shall study the minimum of **60 credits course and opt minimum passing credits as per university rule.**

3. Assessment:

The Skill component of the course will be generally assessed by the respective Sector Skill Councils. In case, there is no Sector Skill Council for a specific trade, the assessment may be done by an allied Sector Council or the Industry partner. Further if Sector Skill Council in concerned / relevant trade has no approved QP which can be mapped progressively or due to any other reason, if the SSC expresses its inability to conduct the assessment or cannot conduct the skill assessment in stipulated time frames as per academic calendar, the institutions may conduct skill assessment through a Skill Assessment Board by 'Certified Assessors' as per the provisions enumerated in MHRD Skill Assessment Matrix for Vocational Advancement of Youth (SAMVAY). The Skill Assessment Board may have Vice-Chancellor/Principal/Director/Nodal officer/Coordinator of the programme / Centre, representatives of the partner industry(s),One nominee of the Controller of Examination or his/her Nominee of affiliating University / Autonomous College and at least one external expert. The affiliating university may nominate additional experts on the Skill Assessment Board, if required.

The certifying bodies may comply with / obtain accreditation from the National Accreditation Board for Certification Bodies (NABCB) set up under Quality Council of India (QCI). Wherever the university/college may deem fit, it may issue a joint certificate for the course(s) with the respective Sector Skill Council(s).

The general education component will be assessed by the concerned university as per the prevailing standards and procedures. General Education credit refers to a unit by which the course work is measured. It determines the number of hours of instructions required per week.

One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week. Accordingly, one Credit would mean equivalent of 14-15 periods of 60 minutes each or 28 – 30 hrs of workshops/ labs. For internship / field work, the credit weightage for equivalent hours shall be 50% of that for lectures /tutorials. For self-learning, based on e-content or otherwise, the credit weightage for equivalent hours of study shall be 50% of that for lectures / tutorials.

The institutions offering B.Voc degree programme should adopt and integrate the guidelines and recommendations of the respective Sector Skill Councils (SSCs) for the assessment and evaluation of the vocational component, wherever available.

Letter Grades and Grade Points: it is recommended to adopt 10- point grading system with the Letter grades as given below:

Grades and Grade Points

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F(Fail)	0
Ab (Absent)	0

Passing percentage for each paper each course is 40%. Separate passing for continuous assessment and end semester examination as per guidelines of the university.
A student obtaining Grade F and Ab shall be considered failed and he/she will be required to reappear in the examination.

Computation of Semester Grade Point Average System (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the course components taken by a student and the sum of the number of credits of all the courses undergone by a student in a semester, i.e.

$$SGPA\ (Si) = \Sigma(Ci \times Gi) / \Sigma Ci$$

where 'Ci' is the number of credits of the i^{th} course component and 'Gi' is the grade point scored by the student in the i^{th} course component.
The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$CGPA = \Sigma(Ci \times Si) / \Sigma Ci$$

Where 'Si' is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

The skill component would be taken as one of the course components in calculation of SGPA and CGPA with given credit weightage at respective level.

Swami Ramanand Teerth Marathwada University, Nanded

PG Diploma in Electronics / Embedded System Design

Syllabus with effective from 2020-2021

Semester I

Sr.	Course Code	Course Title	Total number of period	Continuous Assessment Credits (CA)	End Semester Exam Credits (ESE)	Total Credits
General Education						
1	DES 101	Basic of Microcontroller (8051)	60	1	3	4
2	DES 102	Introduction to PIC	60	1	3	4
3	DES 103	Introduction to smart embedded platforms (Arduino)	60	1	3	4
Practical Courses						
7	DES 104	LAB1	90	1	5	6
8	DES 105	LAB2	90	1	5	6
9	DES 106	Project -1	90	1	5	6
Total						30

Semester II

Sr.	Course Code	Course Title	Total number of period	Continuous Assessment Credits (CA)	End Semester Exam Credits (ESE)	Total Credits
General Education						
1	DES 201	Internet of things	60	1	3	4
2	DES 202	Advanced Microcontrollers	60	1	3	4
3	DES 203	Python for Embedded system	60	1	3	4
Practical Courses						
7	DES 204	LAB3	90	1	5	6
8	DES 205	LAB4	90	1	5	6
9	DES 206	Project -2	90	1	5	6
Total						30

Course Code	Course Title	Credits
DES101	**Basic of Micro controller (8051)**	**04**
Objective	1. To introduce concept of Microcontroller & study of Intel 8051 . 2. To study internal organisation of Microcontroller 8051 3. To study the interfacing 8051 Microcontroller	
Outcome	1. Knowledge of internal architecture and port function of 8051. 2. Instruction set of 8051 and ALP skills. 3. Knowledge of programming using embedded C 4. Knowledge of SFRs, Timers and Interrupts of 8051.	
Unit I	**Architecture of Microcontroller:** block diagram , pin diagram and port function , memory structure . reset circuit ,ALU.	
Unit II	**SFR and Serial Communication:** Timers, Counter , Serial communication , TCON, TMOD,PCON, RS232, basic serial program, timer delay generation	
Unit III	**Instruction set of 8051 :** Addressing modes , instruction set, basic arithmetical and logical programs, Embedded C for 8051 , delay function , interrupt program , basic port programming using embedded C .	
Unit IV	**8051 Interfacing:** Interfacing of LED 7 segment LED , LCD: 4 bit ,8 bit, Relay , Motor, 4x4 matrix key pad.	
Suggested Readings	1.“The 8051 Microcontroller and Embedded Systems – using assembly and C ”, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006. 2. “The 8051 Microcontroller”, Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.	

Course Code	Course Title	Credits
DES 102	**Introduction to PIC**	**04**
Objectives	1. To illustrate the architecture of PIC 18 , PIC16 and PIC 12 2. To introduce the programming and interfacing techniques of PIC microcontroller 3. To understand the interfacing circuits for various applications of PIC	
Outcome	1. The candidate will be able to understand embedded hardware, design for PIC family 2. The Candidate able to use compiler used for programming the PIC Microcontroller with peripherals 3. The course will provide the knowledge of applications and interfacing of PIC microcontrollers	
Unit I	**Architecture of PIC Microcontroller** :Overview of the PIC18 Family , PIC 16 and PIC 12	
Unit II	**PIC peripherals theory**: Timer , Interrupt , ADC Serial Port Programming examples.	
Unit III	**Interfacing of peripheral devices:** LCD, Stepper motor , DC motor with Motor driver IC , Switches	
Unit IV	**PIC 12 Architecture:** basic programming with PIC 12 , Software simulation with Proteus	
Suggested Readings	1. Designing Embedded Systems with PIC Microcontrollers: Principles and Applications by Tim Wilmshurst 2. PIC Microcontroller: Your Personal Introductory Course by John Morton 3. Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation by Martin P. Bates	

Course Code	Course Title	Credits
DES103	**Introduction to smart embedded platforms (Arduino)**	**04**
Objective	1. To provide knowledge of different Smart System applications. 2. To familiarize students with Arduino as IDE, programming language & platform. 3. To provide knowledge of Arduino boards and basic components. 4. Develop skills to design and implement various smart system application	
Outcome	1. Learn the basics of electronics, including reading schematics (electronics diagrams) 2. Learn how to prototype circuits with a breadboard 3. Learn the Arduino programming language and IDE 4. Program basic Arduino examples 5. Prototype circuits and connect them to the Arduino	
Unit I	**Arduino Environment:** Introduction to Arduino IDE, Arduino Libraries.	
Unit II	**Special Functions of Arduino:** IDE introduction to Arduino UNO , advantages , pin configuration of Arduino UNO , programming with Arduino UNO	
Unit III	**Serial communication:** SPI Communication , I2c Communication , One Wire Protocol , programming examples	
Unit IV	**Overview of Arduino family:** interfacing of LCD , OLED , Servo motor , GSM module, RF module	
Suggested Readings	1. Arduino Projects for Dummies, by Brock Craft (2013) 2. Arduino – Getting Started with Sketches, Simon Monk (2016) 3. Programming Arduino - Next Steps, by Simon Monk (2016)	

Course Code	Course Title	Credits
DES104	**LAB1:**	**06**
	•Interfacing of LEDS •Interfacing of different types of switches • Interfacing of relay module with microcontroller • Interfacing of LDR sensor without ADC • Keypad interfacing • stepper motor interfacing • Simple Dc motor interfacing and rotate it clock wise and Anti clock wise with the help of Motor driver IC L293 D • Liquid Crystal Display Interfacing 16 X 2 in 8 bit and 4 bit mode • Interface the seven segment display and design the two digit up down counter • 8 bit ADC interfacing and display the result on LCD . • Write the program for transmit and receive the data serially From the 8051 • Draw the simple schematic for basic electronic circuit and simulate the results • Design the PCB layout for 5 volt regulated power supply .	

Course Code	Course Title	Credits
DES105	**LAB2:**	**06**
	• Interfacing the temperature sensor with Arduino. • Interfacing of motion sensor • Study the Moisture and humidity sensor with Arduino • Interface the ultrasonic sensor • RF ID tag communication with controller • Design the event counter using IR proxy sensor • RPM measurement system using Hall effect sensor • Interfacing of GPS AND GSM module with Arduino mega • Slope measurement system using accelerometer and gyrometric sensor • Study of Touch screen interfacing with Arduino • Display the alpha numeric data on OLD using Arduino board • Write the program for testing the different communication protocol ie I2C , SPI , serial • Simulate the serial communication using virtual terminal using Proteus software	

Course Code	Course Title	Credits
DES106	**Project-I**	**06**
	This module facilitates course participants to do a project which will make use of all the technologies that they have got acquainted with while advancing through various modules in the course. They can choose a creative project or a project from the list of projects that department offers and start executing by their own. Projects will be basically focused on e microcontroller programming.	

Course Code	Course Title	Credits
DES 201	**Internet of Things**	**04**
Objective	1. To understand the basics of Internet of things and protocols. 2. To introduce some of the application areas where Internet of Things is used . 3. To understand the concepts of Web of Things	
Outcome	1. Students will understand the significance of the Internet of Things. 2. Students will able to learn architecture, operation, and business benefits of an IoT solution. 3. Students will explore the relationship between IoT, cloud computing, and big data	
Unit I	**Introduction of IoT:** Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues	
Unit II	**IoT Technology stack:** Sensors & Actuators ,Hardware Platforms ,Wireless Communication Protocols ,Network communication Protocols Cloud, its components and IoT Data Streaming in IoT ,	
Unit III	**Protocol Standardization for IoT:** Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BAC Net Protocol	
Unit IV	**Web of Things versus Internet of Things**: Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring	
Suggested Readings	1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012. 2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011. 3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010. 4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applicationsand Protocols", Wiley, 2012.	

Course Code	Course Title	Credits
DCH202	**Advance Micro Controllers**	**04**
Objective	1. To study the introduction to the TI MSP430 family of microcontrollers, their architecture, peripheral features and programming. 2. To understand and Provide theoretical and practical aspects of low-power system development using the MSP430.	
Outcome	1. Students can Develop Embedded application using Embedded C Programming . 2. Students can use ARM Cortex M with Embedded C Programming for Application Development	
Unit I	**Introduction to ARM Cortex Architecture:** Introduction to ARM Architecture, Overview of ARM, Overview of Cortex Architecture of memory – Code memory, External Memory, Internal memory, Register Set	
Unit II	**Cortex M3 based controller architecture:** Memory mapping, Cortex M3 Peripherals – GPIOs, Timers, UARTs, ADC, Cortex M3 interrupt handling – NVIC. Application development with Cortex M3 controllers with standard peripheral libraries.	
Unit III	**MSP430 Architecture and Programming :** Architecture of the MSP430, addressing modes, instruction set, development environment, MSP430 programming in C and assembly language.	
Unit IV	**Communication Peripherals the MSP430 :** SPI and I²C features in MSP430, asynchronous serial communication, case studies of the applications of the MSP430 in embedded systems.	
Suggested Readings	1. The Definitive Guide to the ARM Cortex M3, Joseph Yiu, Newnes. 2. John Davies, "MSP430 Microcontroller Basics", Newnes (Elsevier Science), 2008. 3. C P Ravikumar, "MSP430 Microcontroller in Embedded System Project," Elite Publishing House Pvt. Ltd., December 2011. 4. MSP430 Teaching CD-ROM, Texas Instruments, 2008. 5. Sample Programs for MSP430 downloadable from www.msp430.com.	

Course Code	Course Title	Credits
DCH203	**Python for Embedded system**	**04**
Objective	1. To learn and understand Python programming basics and paradigm. 2. To learn the use of python for Raspberry Pi 3 3. To elucidates concepts related to Internet of Things. 4. To get hands on experience in working with Raspberry Pi 3 and exploring IoT.	
Outcome	1. The students will able to understand the working of Raspberry Pi and its features . 2. The students will learn how various components used with Pi. 3. The students will able to understand IoT practically.	
Unit I	**Basics of Python Programming:** Features of Python, History and future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Input operation	
Unit II	**Basic functionality of Raspberry Pi:** Getting Started with Raspberry Pi Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS. Basics of Linux and its use, main features including navigating the file system and managing processes, text based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution	
Unit III	**Interfacing Hardware with the Raspberry:** Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface, Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.	
Unit IV	**Communication with devices through the pins of the Raspberry:** Pi, Rpi. GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface	
Suggested Readings	1. Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons 2. Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons 3. Michael Margolis, "Arduino Cookbook", First Edition, March 2011, O'Reilly Media, Inc	

Course Code	Course Title	Credits
DES 204	**LAB4**	**06**
	• Interface of Temperature sensor with MSP • LED and Relay operations with MSP • Proximity sensors interface with ARM cortex • Obstacle Distance measurement using Ultrasonic sensor • Home security using IR module and speaker using MSP • LCD Interfacing 4 bit mode using ARM cortex • Sound operated door lock using MSP • I2c communication over LCD and ARM • Switches and relay interfacing using MSP • 2 digit Up down counter over 7 segment using MSP	

Course Code	Course Title	Credits
DES 205	**LAB 5**	**06**
	• To create a database & Store the value in Raspberry Pi • To install Android on Raspberry Pi • To interface ADC at GPIOs of Raspberry Pi for measuring analog voltage. • To interface the OLED display with Raspberry Pi • Write a Python Program to perform different arithmetic operations i.e., addition, division • Write a Python Program to perform Binary Search • Write a Python program to find first n prime numbers. • To develop the security system for automobile using raspberry pi • Develop the Gate control system over the email • Design food dispenser system for pets using raspberry pi	

Course Code	Course Title	Credits
DES206	**Project-II**	**06**
	This module will allow the student to do a project, student can make use of the all the technical concepts and programming methods that they have learned so far, the project must be of potential level and with good application. Students will be encourage to do the project only on IoT concept.	