"Dissemination of Education for Knowledge, Science and Culture"
-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE, KOLHAPUR

(AN EMPOWERED AUTONOMOUS INSTITUTE)

DEPARTMENT OF ELECTRONICS

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

NEP- 1.0

Curriculum, Teaching and Evaluation Structure

(as per NEP-2020 Guidelines)

for

B.Sc.-III Electronics

Semester-V & VI

(Implemented from academic year 2025-26 onwards)

Departmental Teaching and Evaluation scheme

Second Year Semester-V & VI

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	SEE	CIE	PR	Marks	
Semester-V										
1	DSC-IX	DSC03ELE51	Fundamentals of Instrumentation	2	-	40	10	-	50	2
2	DSC-X	DSC03ELE52	8051 Embedded Systems	2	-	40	10	-	50	2
3	DSC-XI	DSC03ELE53	Antenna and Wave Propagation	2	-	40	10	-	50	2
5	DSE-I	DSE03ELE51	Programmable Logic Controller(PLC)	2	-	40	10	-	50	2
		DSE03ELE52	Opto-electronics							
5	VSC-PR-IV	VSC03ELE59	Computer Networks Lab-I	-	4	-	-	25	25	2
6	FP	FPR03ELE51	Field Project	2	-			50	50	2
7	DSC-PR-V	DSC03ELE59	DSC Electronics Lab-5	-	12	-	-	75	75	6
8	MIN-IX	MIN03ELE51	Fundamental of Internet of Things (IoT)	2	-	40	10	-	50	2
9	MIN-PR-V	MIN03ELE59	MIN Electronics Lab-5	-	4	-	-	25	25	2
Semester –V Total				**12**	**20**	**200**	**50**	**175**	**425**	**22**
Semester-VI										
1	DSC-XII	DSC03ELE61	Industrial Instrumentation	2	-	40	10	-	50	2
2	DSC-XIII	DSC03ELE62	Advanced Microcontroller	2	-	40	10	-	50	2
3	DSC-XIV	DSC03ELE63	Power Electronics	2	-	40	10	-	50	2
4	DSE-II	DSE03ELE61	Internet of Things (IoT)	2	-	40	10	-	50	2
		DSE03ELE62	Cellular and Mobile Communication							
5	VSC-PR-V	VSC03ELE69	Computer Networks Lab-II	-	4	-	-	25	25	2
6	OJT	OJT03ELE61	On Job Training	2	-			50	50	2
7	DSC-PR-VI	DSC03ELE69	DSC Electronics Lab-6	-	12	-	-	75	75	6
8	MIN-X	MIN03ELE61	IoT System Design	2	-	40	10	-	50	2
9	MIN-PR-VI	MIN03ELE69	MIN Electronics Lab-6	-	4	-	-	25	25	2
Semester –VI Total				**12**	**20**	**200**	**50**	**175**	**425**	**22**

Semester -V

B.Sc. III (Electronics), Semester: V

DSC-IX: DSC03ELE51: Fundamentals of Instrumentation

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: understand the fundamentals of measurement and performance characteristics of instruments

CO2: apply fundamental knowledge of Instrument for electrical measurements

CO3: understand the principles, types, and selection criteria of transducers in various engineering applications.

CO4: understand the concepts, principles and types of actuators

Unit	Syllabus	Lectures
Unit 1	**Fundamentals of Measurement** Introduction, Performance characteristics: Static and Dynamic characteristics of instruments, Error: Types of Errors (Gross error, systematic error, and random error), Impedance loading and matching, Calibrations: Definition and classification, Standards of measurement: Definition and types of Standard	10
Unit 2	**Basic Analog Measuring Instruments** DC galvanometer, PMMC and Moving Iron instruments, Voltmeter, Ammeter, RMS and True RMS concept, Extending range of ammeter, Design of multi-range ammeter, Extending range of voltmeter, Design of multi-range voltmeter, Series and shunt type ohmmeter, Single phase wattmeter: construction and working	10
Unit 3	**Transducers** Definition, Classification of Transducers, Selection criterion for Transducers, Detail Study of Transducers: Thermistor, RTD, Thermocouple, Semiconductor sensor(LM 35/AD590), Strain gauge, LVDT, Capacitive transducer (microphone), Opto-electric transducer – LDR, Photo diode, PIR, Ultrasonic sensor, Hall effect sensor, Loud speaker, Piezoelectric transducer, Proximity sensor- Inductive, capacitive	09
Unit 4	**Actuators** Definition, Principle, types and selection of Actuators, linear, rotary, logical and continuous Actuators Electrical actuating systems: Solid-state switches, Relays, Solenoids Electric Motors: Principle of operation Electro-mechanical: Servo, DC motor, Stepper motor	09

Reference Books:

1. Electronic Instruments, K.S. Kalsi, 2nd Edition, Tata Mc-Graw Hill, 2006
2. Transducers & Instrumentation, D V S Murty, 2nd Edition, PHI, 2011
3. Instrumentation Measurement and analysis, Nakra B C, Chaudry K, 3rd Edition, Tata McGraw Hill, 2012

B.Sc. III (Electronics), Semester: V

DSC-X: DSC03ELE52: 8051 Embedded Systems

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: program 8051microcontroller using Embedded C

CO2: interface and control various input and output devices using microcontrollers

CO3: understand and implement ADC and DAC interfacing techniques effectively

CO4: interface various sensors to 8051microcontroller

Unit	Contents	Lectures
1	**Introduction to Embedded C** Advantages and disadvantages of programming in 8051-C & Assembly Language. Data types, Time delay – using *for* loop and using 8051 Timers, I/O programming, Logical operations, Data conversion programs	09
2	**Interfacing of Input Output Devices** Output devices: LED, Relay, Opto-coupler, LCD, Seven Segment Display, Seven Segment Display (multiplexing mode), DC Motor, Stepper Motor Input devices: Switch, 4X4 matrix keyboard, thumb wheel switch	10
3	**ADC, DAC Interfacing** Interface ADC 0804, ADC 0808/0809, ADC MAX1112, DAC 0808 (Triangular wave, Ramp, Staircase)	09
4	**Sensor Interfacing** Reed sensor, smoke sensor, PIR sensor, Temperature sensor (LM 35, PT-100), Humidity sensor (SY HS 230), Light sensor (LDR), Moisture/rain sensor, Gas sensor (MQ series), AC current sensor (CT-current Transformer), AC voltage sensor (PT-potential transformer), LVDT, Ultrasonic module	10

Reference Books:

1. The 8051 Microcontroller and Embedded Systems, M. A. Mazadi, J. G. Mazadi, 2nd Edition, Pearson Education, 2008
2. The 8051 Microcontroller, K. J. Ayala, Penram International Publishing, 2007

B.Sc. III (Electronics), Semester: V

DSC-XI: DSC03ELE53: Antenna and Wave Propagation

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: understand the fundamentals of antenna theory

CO2: get familiarize with different parameters of antenna

CO3: get familiarize with application of antenna according to types of antenna

CO4: create awareness about the different types of propagation of radio waves at different frequencies

Unit	Contents	Lectures
Unit 1	**Antenna Theory** Antenna as an element of wireless communication system, Antenna radiation mechanism, current distribution on thin wire antenna. Types of Antennas, Fundamentals of EMFT: Maxwell's equations and their applications to antennas	10
Unit 2	**Antenna Parameters** Radiation pattern, Main Lobe and Side Lobes, Half-power beam width, Radiation intensity, Antenna efficiency, Directivity, Gain, effective area, effective length, Bandwidth, Polarization, input impedance, radiation efficiency	10
Unit 3	**Radiating wire Structures**(Qualitative idea only) Monopole, Dipole, Folded dipole, Yagi-Uda Antenna, Loop antenna and Bi-conical broadband Antenna Microstrip Antennas: Basics of Microstrip Antennas and its characteristics, feeding methods, design of rectangular Concept of smart antenna: Concept and benefits of smart antennas, Fixed weight beam forming basics, Adaptive beam forming	09
Unit 4	**Radio Wave Propagation** Different Modes of Wave Propagation, Structure of atmosphere, Ground wave propagation, effect of Earth's Curvature on Ground wave propagation, Space Wave propagation Sky Wave Propagation- Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, Virtual Height and Skip Distance, Relation between MUF and skip Distance, Multi-hop Propagation	09

Reference Books:

1. Antenna Theory: Analysis and Design, C. Balanis, 3rd Edition, John Wiley & Sons, 2005
2. Antenna Theory and Design, W. L. Stutzman and G. A. Thiele, 2nd Edition, John Wiley & Sons, 1998
3. Antenna & Wave Propagation by K.D. Prasad, 3rd Edition, Satyaprakash, New Delhi, 2007
4. Principles of Electromagnetism, M. N. O. Sadiku, Oxford University Press, 2001

B.Sc. III (Electronics), Semester: V

DSE-I: DSE03ELE51: Programmable Logic Controller (PLC)

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: At the end of the course, a student will be able to:

CO1: understand the basics of control system

CO2: understand the different types of controllers

CO3: describe typical concepts and components of a Programmable Logic Controller

CO4: understand Ladder programming and design basic PLC circuits for entry-level PLC applications

Unit	Contents	Lectures
Unit 1	**Basics of control system** Introduction, Open loop system, Close loop transfer system, comparison of closed-loop system and open-loop control system, feedback and Feed-forward control system	06
Unit 2	**Controllers** Introduction to controllers, Properties of controller, Classification of controllers: Two position mode controller (ON-OFF), Proportional mode controller(P), Integral controller(I), Derivative controller(D), Proportional Integral controller(PI), Proportional Derivative controller(PD) and Proportional Integral Derivative controller (PID)	10
Unit 3	**Introduction to PLC** Programmable logic controller (PLC) basics: Definition, overview of PLC systems, block diagram of PLC, input/output modules, power supplies, isolators, features like scan time, system scale, user interface. Modular PLC and Redundant PLC and Applications Industrial Communication Buses: RS485, Profibus Distributed control system, DCS components/block diagram, SCADA, adaptive control system	10
Unit 4	**Ladder Programming basics** Basic components: fuse, pushbutton, selector switches, limit switches, indicators, relay, time delay relays functions and symbols. General PLC programming procedures, programming on-off inputs/ outputs. Auxiliary commands and functions, PLC Basic Functions: Register basics, timer functions, counter functions. Ladder Programming: Programs for Boolean logic and flip-flops, counters, timers, flasher. Application program Bottle filling plant, elevator control, washing machine control	12

Reference Books:

1. Control Systems, U. A. Bakshi, V.U. Bakshi, 2nd Edition, Technical Publication, 2015
2. Process control Instrumentation Technology, Curtis D. Johnson, 8th Edition, PHI, 2009
3. Computer Based Industrial Control, Krishna Kant, 3rd Edition, PHI, 2004
4. Programmable Logic Control Programming And Applications, John R. Hackworth Frederic D. Hackworth, 4th Edition, Pearson Education India, 2008

B.Sc. III (Electronics), Semester: V

DSC-PR-V: DSC03ELE59: DSC-Electronics Lab-5

Credits: 06 **Practical: 180 hrs.** **Marks: 75**

(Practical: Four lectures of 60 minutes thrice in a week per batch)

Group A

1. Design of multi-range ammeter, voltmeter, conversion of ammeter into voltmeter
2. Study of temperature sensor RTD and Thermistor
3. Automatic Porch light control using LDR and relay
4. Measurement of displacement using LVDT
5. Study of ON/OFF Temperature controller (LM34/LM35/AD590)
6. Study of Actuator (Solenoid)

Group B

1. Study of Timers in 8051 Microcontroller.
2. LED and Relay interfacing to 8051 microcontroller.
3. Switches and 4x4 matrix keyboard interfacing to 8051 microcontroller
4. Interfacing of single seven segment display with 8051
5. LCD interfacing with 8051 Microcontroller.
6. DC motor interfacing to 8051microcontroller.
7. Stepper Motor interfacing to 8051 microcontroller.
8. DAC0808 interfacing to 8051microcontroller.
9. ADC0804 interfacing to 8051microcontroller
10. PIR sensor interfacing with 8051 Microcontroller

Note: All the above experiments are to be written in Embedded C

Group C

1. Study of simple dipole λ/2 antenna
2. Study of folded dipole λ/2 antenna
3. Study of simple dipole λ/4 antenna
4. Study of Yagi-Uda with 3 and 5 element simple dipole antenna

Group D

1. Study of PLC Simulator (TriLOGI Software)/ codesys-software/ hardware and implementing Boolean function
2. Programming with PLC (TriLOGI Software)/ codesys-software/ hardware) for sequential logic RS-FF, JK-FF
3. Programming with PLC (TriLOGI Software)/ codesys-software/ hardware) for sequential logic T-FF, D-FF
4. Study of PLC timers and counters in PLC ((TriLOGI Software)/ codesys-software/ hardware)

Distribution of Marks for Practical Examination (LAB):
DSC-PR-V: DSC03ELE59: DSC-Electronics Lab-5

Group	A	B	C	D	Journal	Industrial Visit/ Seminar	Total

Marks	15	15	15	15	10	05	75

B.Sc. III (Electronics), Semester: V

VSC-PR-V: VSC03ELE59: Computer Network-I Lab

Credits: 02 **Practical: 60hrs.** **Marks-25**

(Practical: Four lectures of 60 minutes per week per batch)

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices
3. Study of network IP
4. Connect the computers in Local Area Network
5. Study of basic network command and Network configuration commands
6. Performing an Initial Switch Configuration
7. Performing an Initial Router Configuration
8. Configuring and Troubleshooting a Switched Network
9. Connecting a Switch
10. Configuring WEP on a Wireless Router
11. Using the Cisco IOS Show Commands
12. Examining WAN Connections
13. Interpreting Ping and Trace route Output

Marks Distribution of VSC-PR-V: VSC03ELE59: Computer Network-I Lab

Practical Work	Journal/Report	Total
20 Marks	05 Marks	25 Marks

B.Sc. III (Electronics), Semester: V

MIN-IX: MIN03ELE51: Fundamental of Internet of Things (IoT)

Credits: 02 **Theory: 30hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: understand the basic architecture of Internet of Things based Devices

CO2: illustrate wireless communication systems

CO3: identify actuators and sensor technologies for s for sensing real world entities

CO4: implement IoT with Arduino

Unit	Contents	Lectures
Unit 1	**Introduction to IoT** Introduction, Definitions & Characteristics of IoT, Evolution of IoT(Introduction to Industry 4.0), IoT Architecture, Physical & Logical Design of IoT, Functional Blocks of IoT, Enabling Technologies in IoT, IoT and M2M, Applications.	07
Unit 2	**Sensors & Actuators** Over view of wireless sensor network, Sensor Characteristics, Types of sensor and working principle, Sensors used in IoT, Actuators, Types of actuators, Comparison between Sensors and Actuators	07
Unit 3	**Communication Technologies for IoT** Basics of Networking (OSI Model), IEEE standards. , IoT Stack, Overview of Wireless Sensor Networks Wireless Communication Technologies: RFID, 6LoWPAN, ZigBEE, NFC, Z-wave, Bluetooth, WI-Fi, RF, GSM/GPRS, Wired Communication Technologies: UART/USART, SPI, I2C and Ethernet	08
Unit 4	**Implementing IoT with Arduino** Implementing IoT with Arduino: Introduction to Arduino Platforms, Arduino Uno architecture, IDE setup, importing Arduino boards in Arduino IDE tool, Installation of Arduino libraries, Basics of Embedded C Programming, Interfacing of Sensors and Actuators to Arduino Uno	08

Reference Books:

1. Raj Kamal," Internet of Things: Architecture and Design", McGraw Hill.2nd edition June 2022
2. "Internet of Things: A Hands-on Approach", Arshdeep Bahga and Vijay Madisetti, Universities, Press.2nd Edition.
3. "IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things", David Hanes, Gonzalo salgueiro Cisco Press, Kindle 2017 Edition.
4. Programming Arduino: Getting started with sketches, 2ndEdition,Simon Monk, ISBN: 978-1259641633, Tata McGraw Hill Publication.

B.Sc. III (Electronics), Semester: V

MIN-PR-V: MIN03ELE59: MIN-Electronics lab-5

Credits: 02 Practical: 60hrs. Marks-25

(Practical: Four lectures of 60 minutes per week per batch)

(Note: Minimum 05 experiments has to perform from each group)

1. Basics of Internet of Things: Sensors, Actuators, IoT architecture and Gateway
2. Introduction to Arduino UNO
3. Interfacing of LED to Arduino
4. Interfacing of LED and Relay, buzzer to Arduino
5. To interface LCD to Arduino
6. Interfacing of Temperature and humidity sensor to Arduino
7. Interfacing of Soil moisture sensor to Arduino
8. Interfacing of ultrasonic sensor to Arduino
9. Interfacing of Accelerometer sensor to Arduino
10. Interfacing of IR sensor to Arduino
11. Interfacing of PIR sensor to Arduino
12. Interfacing of DC Motor to Arduino
13. Interfacing of stepper motor to Arduino
14. Interfacing of servo motor to Arduino
15. Interface Bluetooth to Arduino and send data to smartphone through Bluetooth.
16. Interface Bluetooth to Arduino and receive data to smartphone through Bluetooth to turn LED ON/OFF
17. Interface ZIGBEE Module to Arduino to turn LED ON/OFF
18. Interface Wi-Fi module to Arduino

Marks Distribution of MIN-PR-V: MIN03ELE59: MIN-Electronics lab-5

Practical Work	Journal/Report	Total
20 Marks	05 Marks	25 Marks

Semester -VI

B.Sc. III (Electronics), Semester: V

DSC-XII: DSC03ELE61: Industrial Instrumentation

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: design and study different OP-AMP circuits

CO2: design and implement active filter circuits

CO3: distinguish analog and digital instruments

CO4: design and implement VCO, V to F and V to F converter using different ICs

Unit	Contents	Lectures
Unit 1	**Signal Conditioning –I** Introduction, Sample and Hold circuit, Thermistor, Wheatstone bridge amplifier, Instrumentation amplifier, Attenuator, Convertor: V-I, I-V, V-F and F-V	10
Unit 2	**Signal Conditioning –II** Introduction to Passive and active filter, Advantage of active filters over passive filters. Study of filter response (Butterworth, Chebyshev.) Different types of active filters. Study and design of low pass, high pass, band pass and band stop filters	10
Unit 3	**Digital Instruments** Introduction to Data Acquisition System (DAS), Single channel & multi channel DAS. Data logger, digital instruments like Digital Multimeter, Digital Tachometer, Digital Capacitance Meter, Digital Phase Meter, Digital Frequency Meter. Digital pH meter	09
Unit 4	**Application of Linear ICs** Block diagram of PLL with functioning of each block, calculation of capture range and lock range frequencies, application of PLL (frequency multiplier, FM modulator, frequency synthesizer and FSK) Study of IC565, study of function generator IC 8038, study of VCO 556	09

Reference Books:

1. Op-amp and Linear Integrated Circuits, Ramakant Gayakwad, 4th Edition, PHI, 1994
2. Electronic Instruments, K.S. Kalsi, 2nd Edition, Tata Mc-Graw Hill, 2006
3. Instrumentation Measurement and analysis, B. C. Nakra, K. K. Chaudhry, 3rd Edition ,Tata McGraw Hill, 2012
4. Linear Integrated Circuits, D. Roy Choudhury, 4th Edition, New Age International, 2012

B.Sc. III (Electronics), Semester: V

DSC-XIII: DSC03ELE62: Advanced Microcontroller

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: understand the architecture and function of each pin of AVR 8-bit Microcontroller

CO2: write, debug and simulate embedded C language programs

CO3: understand Timer operation, Interrupt environment and Serial Communication

CO4: understand the interfacing of various systems with AVR microcontroller

Unit	Contents	Lectures
Unit 1	**Embedded Systems Design** What is embedded system, embedded system basic blocks, embedded system hardware and software, embedded system characteristics, embedded system applications	04
Unit 2	**Introduction to AVR microcontroller** Overview of AVR family, ATmega8 pin configuration & function of each pin. AVR Microcontroller architecture, status register, Special function registers, SRAM, ROM & EEPROM space, On-Chip peripherals	06
Unit 3	**AVR Programming in C** AVR Data types, AVR I/O port programming, Timer programming, Input capture and Wave Generator, PWM programming, External Interrupt programming, ADC programming, Serial Port programming	12
Unit 4	**Peripheral Interfacing and Embedded System** Interfacing of Switches, Relays, LEDs, seven segment display, 16x2 LCD Interfacing, Stepper interfacing Designing of an Embedded System: DC Motor speed control using PWM technique, Measurement of Temperature of an environment using sensor LM35, Dual channel Digital Voltmeter. (Block diagram, Schematic and Flowchart is only necessary)	16

Reference Books:

5. The AVR Microcontroller and Embedded Systems Using Assembly and C, Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, 1st Edition, Pearson Education, 2017
6. Embedded system design with Atmel AVR microcontroller, Steven F Barrett, 2nd Edition, Morgan & Claypool Publishers, 2018
7. Programming and Customizing the AVR Microcontroller, Dhananjay Gadre, 2nd Edition, McGraw Hill Education, 2012
8. AVR ATmega8 data sheet, 2013 https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-2486-8-bit-AVR-microcontroller-ATmega8_L_datasheet.pdf

B.Sc. III (Electronics), Semester: V
DSC-XIV: DSC03ELE63: Power Electronics

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to -

CO1: understand basic power electronic devices and their role in power conversion

CO2: understand the types, characteristics, and applications of Thyristors

CO3: understand and analyse performance of controlled and uncontrolled converters.

CO4: understand working principles of Power Systems

Unit	Contents	Lectures
1	**Power semiconductor devices** Definition of power electronics, Need for semiconductor power devices, Applications of power electronics, classification of power semiconductor devices. **Power diode:** structure, operation, conductivity modulation, I-V characteristics, Reverse recovery effect, series and parallel connection of diode, **Power transistor:** structure, operation, effect of drift layer. Switching characteristics, specifications, Base drive circuits. **Power MOSFET:** MOSFET structure, characteristics, operation and drive circuits	10
2	**Thyristors** Types of Thyristors, Structure of SCR, SCR Characteristics, two transistor analogy - Methods of turning ON and turning OFF, dv/dt and di/dt protection, gate protection circuits Diac and Triac: Basic structure, working and V-I characteristic, application of a Diac as a triggering device for a Triac IGBT: Structure, characteristics, Operation and drive circuits, Comparison of power transistor, MOSFET and IGBT	09
3	**Controlled Rectifiers** Basics of single and three phase supply phase and line voltage waveforms, SCR as a static switch, phase controlled rectification, single phase half wave, full wave and bridge rectifiers with resistive & inductive loads. (Analysis of all these circuits with resistive load only)	09
4	**Power Systems** Power Supplies: Switch mode power supply (DC): flyback, forward, half bridge and full bridge converters. Uninterrupted power supply (UPS), Electronic Ballast, Power factor correction.	10

Reference Books:

1. Power electronics: circuits, devices, and applications, M.H. Rashid, PHI, 2nd Edition, Pearson Education India, 2009
2. Power Electronics: Converters, Applications and Design, N. Mohan, T. M. Undeland, W.M. Robbins, Wiley India Edition, 2007
3. Power Electronics, Dr. P.S. Bhimbhra, 4th Edition, Khanna Publishers, New Delhi, 2012

B.Sc. III (Electronics), Semester: V

DSE-II: DSE03ELE61: Internet of Things (IoT)

Credits: 02 **Theory: 30 hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to –

CO1: gain knowledge about the architecture of IoT systems

CO2: study the working principle of various types of sensors and actuators used in IoT applications

CO3: explore wireless technologies for IoT and gain an overview of different IoT protocols

CO4: explore cloud platforms used in IoT, including IoT dashboards and various cloud service providers

Unit	Contents	Lectures
Unit 1	**IoT Introduction & Concepts** IoT Architecture, Physical & Logical IoT design, Basics IoT Enabling, Technologies, IoT Stack, IoT Applications	09
Unit 2	**Sensors & Actuators** Sensor working, Sensor Characteristics, Types of sensors and working principle, Sensors used in IoT	09
Unit 3	**Wireless Technologies for IoT** Overview of Wireless Sensor Networks, IEEE standards for IoT, Overview of Wireless Modems (RF, GSM/GPRS, Bluetooth, Wi-Fi etc.), Node MCU and ESP32 IoT Protocol : Overview, MQTT, COAP, http/https , 6LowPAN	10
Unit 4	**Cloud platforms for IoT** IoT dashboards, Introduction to various cloud platforms, Device and data management from Cloud Platforms, Uploading data from hardware platforms to cloud Applications: Home Automation, Smart Cities etc.	10

Reference Books:

1. Internet of Things: A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, 2nd Edition, Universities Press, 2013
2. IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, 2nd Edition, Cisco Press, Kindle, 2017
3. Analytics for the Internet of Things(IoT), Andrew Minteer, 1st Edition, Kindle Edition, 2017
4. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, 1st Edition, Paperback Publications, 2016

B.Sc. III (Electronics), Semester: VI

DSC-PR-VI: DSC03ELE69: DSC-Electronics Lab-6

Credits: 06 **Practical: 180hrs.** **Marks: 75**

(Practical: Four lectures of 60 minutes thrice in a week per batch)

Group A

1. Study of solid state relay
2. Function generator using IC 8038
3. Instrumentation amplifier using OPAMP
4. Study of active filter : Low and High Pass
5. Study of active filter : Band Pass
6. Study of V to F and F to V using VCO

Group B

1. Interfacing of Switches and LED with Arduino/AVR microcontroller.
2. LCD Interfacing with Arduino/AVR microcontroller.
3. Stepper Motor Interfacing with Arduino/AVR microcontroller.
4. Interface temperature sensor LM35 with Arduino board and display temperature on LCD.
5. Interface temperature sensor and Humidity Sensor (DHT11) with Arduino/AVR board and display temperature and humidity values on LCD.
6. Accelerometer Sensor Interfacing with Arduino/AVR microcontroller.

Group C

1. AC Voltage controller
2. Speed Control of DC Motor.
3. Phase Shift control of SCR
4. Design of Single phase full wave controlled rectifier
5. To study the simulation of single phase half wave controlled rectifier with R & RL load using MATLAB - Simulink/Scilab
6. To study the simulation of single phase full wave controlled bridge rectifier with R load using MATLAB - Simulink/Scilab

Group D

1. Study the fundamental of IOT Architecture, Arduino and necessary software and create the thingspeak account
2. Interface Bluetooth with Arduino and send the sensor data to smartphone through Bluetooth
3. Interface Bluetooth with Arduino and receive the data from smartphone through Bluetooth to turn LED ON/OFF
4. log temperature and humidity data, and visualize using platforms like ThingSpeak
5. IOT Smart Parking using RFID
6. IOT Early Flood Detection & Avoidance
7. IOT Garbage Monitoring

Distribution of Marks for Practical Examination (LAB):

Group	A	B	C	D	Journal	Industrial Visit/ Seminar	Total
Marks	15	15	15	15	10	05	75

B.Sc. III (Electronics), Semester: VI

VSC-PR-V: VSC03ELE69: Computer Network-II Lab

Credits: 02 **Practical: 60hrs.** **Marks-25**

(Practical: Four lectures of 60 minutes per week per batch)

1. Demonstrating Distribution Layer Functions
2. Placing ACLs
3. Exploring Different LAN Switch Options
4. Implementing an IP Addressing Scheme
5. Examining Network Address Translation (NAT)
6. Observing Static and Dynamic Routing
7. Configuring Ethernet and Serial Interfaces
8. Configuring a Default Route
9. Configuring Static and Default Routes
10. Configuring RIP
11. Planning Network-based Firewalls
12. Configuring a Cisco Router as a DHCP Server

Marks Distribution of VSC-PR-V: VSC03ELE69: Computer Network-II Lab

Practical Work	Journal/Report	Total
20 Marks	05 Marks	25 Marks

B.Sc. III (Electronics), Semester: VI
MIN-X: MIN03ELE61: IoT System Design

Credits: 02 **Theory: 30hrs.** **Marks-50**

Course Outcomes: After the completion of the course the student should be able to –

CO1: understand IoT protocols
CO2: understand Cloud Platforms
CO3: design IoT systems with ESP8266
CO4: design and implement IoT Applications

Unit	Contents	Lectures
Unit 1	**IoT Protocols** Internet and Web layering (Overview of the OSI Model), IoT protocols - MQTT, MQTT-SN, Constrained Application Protocol (CoAP), HTTP, STOMP, AMQP, Comparison of IPv4 and IPv6 protocols	07
Unit 2	**Cloud Platforms** Evolution of Cloud Computation, Commercial clouds and their features, open source IoT platforms, cloud dashboards, Interfacing and data logging to cloud: Blynk, Thing speak, platforms. Virtualization concepts and Cloud Architecture, Cloud computing, benefits, Cloud services -- SaaS, PaaS, IaaS , Cloud providers & offerings, Study of IOT Cloud platforms	08
Unit 3	**Basic Networking with ESP8266** Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library , Web server- introduction, installation, configuration, Posting sensor(s) data to web server	08
Unit 4	**IoT Case Studies** Home Automation, Agriculture, Health Care, Industrial Automation, Logistic	07

Reference Books:

1. Raj Kamal," Internet of Things: Architecture and Design", McGraw Hill.2nd edition June 2022
2. "Internet of Things: A Hands-on Approach", Arshdeep Bahga and Vijay Madisetti, Universities, Press.2nd Edition.
3. "IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things", David Hanes, Gonzalo salgueiro Cisco Press, Kindle 2017 Edition.
4. "Analytics for the Internet of Things(IoT)",Andrew Minteer, Kindle Edition,1st edition.

B.Sc. III (Electronics), Semester: VI

MIN-PR-VI: MIN03ELE69: MIN-Electronics lab-6

Credits: 02 Practical: 60hrs. Marks-25

(Practical: Four lectures of 60 minutes per week per batch)

(Note: Minimum 05 experiments has to perform from each group)

1. Introduction to ESP 8266
2. Creation Of Things Speak Account/Blynk
3. Interfacing of Temperature and humidity sensor to ESP 8266 and upload sensor data to thing speak cloud
4. Interfacing of Temperature and humidity sensor to ESP 8266 and retrieve sensor data from thing speak cloud
5. Interfacing of ultrasonic sensor to ESP 8266 and upload sensor data to thing speak cloud
6. Interfacing of Accelerometer sensor to ESP 8266 and upload sensor data to thing speak cloud
7. Interfacing of Soil moisture sensor to ESP 8266 and upload sensor data to thing speak cloud
8. Interfacing of ultrasonic sensor to ESP 8266 and upload sensor data to thing speak cloud
9. Interfacing of IR sensor to ESP 8266 and upload sensor data to thing speak cloud
10. Interfacing of PIR sensor to ESP 8266 and upload sensor data to thing speak cloud
11. Interface ZIGBEE Module to ESP 8266 to turn LED ON/OFF
12. Study and implement MQTT protocol using ESP 8266
13. LED control using ESP 8266 via web (http protocol)
14. IOT Application Case study: Home Automation.

Marks Distribution of MIN-PR-V: MIN03ELE69: MIN-Electronics lab-6

Practical Work	Journal/Report	Total
20 Marks	05 Marks	25 Marks

Q.3. Attempt any FOUR (Four marks each): **[16]**

i) Xyzabcdefghijklmnop.

ii) Xyzabcdefghijklmnop.

iii) Xyzabcdefghijklmnop.

iv) Xyzabcdefghijklmnop.

v) Xyzabcdefghijklmnop.

CHAIRMAN
BoS ELECTRONICS
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)