BENGALURU CITY UNIVERSITY

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

Syllabus for Electronics
(V & VI Semester)

2023-24

Proceedings of the BoS in Electronics (UG).

Proceedings of the Board of studies (BoS) in Electronics (UG) meeting held on August 24th and 25th 2023 in the Department of Electronic Science, Jnana Bharathi Campus, Bangalore University, Bengaluru-560056.

The Members were present for the meeting are;

SlNo.	Name	Designation	Signature
1.	Dr. J T Devaraju, Professor, Department of Electronic Science, Bangalore University, Bengaluru–560056	Chairman	
2.	Sri. K M Thipperudra Swamy Associate Professor, Department of Electronics, Vivekananda Degree College, Bengaluru– 560055	Member	
3.	Sri. S M Mruthunjaya Swamy Associate Professor, Department of Electronics, Vijaya College, R V Road, Bengaluru– 560004	Member	
4.	Sri. S Sanjeev Associate Professor, Department of Electronics, Vijaya College, Jayanagar, Bengaluru– 560011	Member	
5.	Dr. H J Thontadharya Associate Professor, Department of Electronics, Vijaya College, R V Road, Bengaluru– 560004	Member	
6.	Sri. K G Lakshminarayana Associate Professor, Department of Electronics, Vijaya College, Jayanagar, Bengaluru– 560011	Member	
7.	Smt. Rajashri Padaki Associate Professor, Department of Electronics, Seshadripuram First Grade College, Yelahanka New town, Bengalure-560064	Member	
8.	Dr. Mohana H K Associate Professor, Department of Electronics, Seshadripuram First Grade College, Yelahanka New town,Bengaluru -560064	Member	
9.	Dr. Ravi Kolarkar G Associate Professor, Department of Electronics, Nrupathunga University, Bengaluru -560001	Member	Absent
10	Dr. Bharathi Assistant Professor, Department of Electronics, Maharani Cluster University, Bengaluru -560001	Member	ABSENT
11	Sri. Vijaya Kumar A Patil Associate Professor, DepartmentofElectronics,Basaveshwara College of Commerce, Arts and Science, Bengaluru -560010	Co-opted Member	
12	Dr. M Subrayamanya Bhat Associate Professor, Department of Electronics, Vijaya College, R V Road, Bengaluru– 560004	Member Convener	

The Chairman extended warm welcome to all the BoS Members and thanked them for accepting the assignment.

Resolutions:

1. The board prepared V & VI Semester Syllabus to be implemented for the academic year 2023-24 onwards for both theory & practical, it was unanimously approved after deliberations.

2. The board also discussed & approved for teaching Skill Enhance Course and Ability Enhancement Compulsory Course selective papers like Digital Fluency, Artificial Intelligence, Big Data, Data Communication, Computer Architecture and Cyber Security are taught by "Electronics Faculty Members".

3. The Scheme of awarding marks for Theory, Practical as well as Internal Assessment (IA) was discussed. The pattern approved for earlier semesters is retained for the V & VI semesters also.

4. It was resolved that, number of students for practical's shall be 10 (Ten) per batch per teacher.

5. Committee feels to review the First Semester and onwards NEP syllabus to be implemented for the academic year 2024-25.

6. The board also Prepare & approved the Panel of Examiners for the academic year 2023-24

7. Constitution and Approved the BoE in Electronics (UG) for the academic year 2023-24

Finally, the Chairman extended vote of thanks to all BoS members for their active participation.

Chairman

Dr. J.T. Devaraju
Professor
Dept. of Electronic Science

APPENDIX-1: Course Pattern and Scheme of Examination for B.Sc.(Basic) / B.Sc.(Hons.) as per NEP (2021-22 and Onwards)

Subject: Electronics

Sl. No.	Semester	Title of the Paper	Teaching Hours	Hours / week		Examination Pattern Max. & Min. Marks /Paper						Duration of Exam (hours)		Total Marks / paper	Credits	
						Theory			Practical							
				Theory	Practical	Max.	Min.	IA	Max.	Min.	IA	Theory	Practical		Theory	Practical
1	V	**DSCEL 501: Paper-5: Communication II**	60	4		60	21	40				2.5		100	4	
		DSCELP 501: Paper-5: Communication II Lab	60		4				25	13	25		4	50		2
2	V	**DSCEL 502: Paper 6 : Embedded Controllers**	60	4		60	21	40				2.5		100	4	
		DSCELP 502:Paper -6: Embedded Controllers Lab	60		4				25	13	25		4	50		2
3	VI	**DSCEL 601:Paper - 7 :Electronic Instrumentation and Biomedical Instruments**	60	4		60	21	40				2.5		100	4	
		DSCELP601:Paper - 7 : Instrumentation and IoT Lab	60		4				25	13	25		4	50		2
4	VI	**DSCEL 602: PAPER 8: Internet of Things and Robotics**	60	4		60	21	40				2.5		100	4	
		DSCELP 602: Paper - 8: Project Lab	60		4				25	13	25		4	50		2

Scheme of Internal Assessment Marks: Theory

Sl. No.	Particulars	IA Marks
1	Attendance	10
2	Internal Tests (Minimum of Two)	20
3	Assignments /Seminar / Case Study / Project work / Reports on - visits to industries/exhibitions/science centre / active participation in Electronics competitions, etc.	10
	TOTAL Theory IA Marks	40

Scheme of Internal Assessment Marks: Practical

Sl. No.	Particulars	IA Marks
1	Practical Test	05
2	Report on datasheet of electronic devices / Seminar on electronics experiments, etc.	10
3	Active participation in practical classes	10
	TOTAL Practical IA Marks	25

APPENDIX- 2: S y l l a b u s

Semester- V

DSCEL501: Paper-5: Communication II

(Credits: Theory – 04, Practical – 02) **Total Teaching: 60 Hrs**

Hours of Teaching: 4 Hrs / Week

Course Objectives: After the successful completion of the course, the student will be able to:

- To understand the various microwave devices and their working
- To understand principle and working of different digital modulation techniques.
- To understand the principle and working of Cellular Communication, different wireless techniques and mobile handset.
- To understand various OSI layers, Wi-Fi and IEEE standards.

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

- Know the various microwave devices, their working and applications.
- Familiar with ASK, FSK, PSK, BPSK, QPSK digital modulation techniques.
- Understand the basic concept of cell phone handset, working principle of cellular communication and wireless technologies.
- Understand different Computer Networks, OSI layers, Ethernet and IEEE 802.11 a/b/g/n standards.

Unit 1 15 Hrs

Microwave Devices: RF/Microwaves, EM spectrum, Wavelength and frequency, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators, GUNN diode, READ diode, IMPATT diode, BARITT diode, PIN diodes, Schottky barrier diodes, Multi cavity Klystron, Magnetron, block diagram of Microwave communication and working, Applications.

Unit 2 15 Hrs

Digital Communication: Block diagram of digital transmission and reception, Bit Rate and Baud. Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK), 8PSK, 16PSK, 64PSK - definition and waveforms for each.

Quadrature amplitude modulation (QAM): 16 QAM and 64 QAM - definition and waveforms for each. Advantage and disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer, MODEM– modes and classification.

Unit 3 15 Hrs

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, Absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, Multiplexing, FDMA, WCDMA, TDMA, OFDMA, GSM- Qualitative analysis.
Bluetooth, Zigbee, Wi-Fi, MIMO, LTE, 5G technology and CV2X- qualitative analysis. Simplified block diagram of cellular phone handset. Wireless channel characteristics.

Unit 4 15 Hrs

Computer Networks: Introduction to Networks, Categories of Networks, Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Switching, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission. Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11a/b/g/n, Connecting LANs.

Suggested Learning Resources

Reference Books

1 D Roddy and J. Collen,"Electronicscommunications",4th edition, PHI,2008.

2 B. P. Lathi and ZhiDing, "Modern Digital and Analog Communication Systems", Oxford University Press,4thEdition, 2010

3 Bernard S k la 'Digital Communications: Fundamentals and Applications" Pearson Education, 2nd edition, 2009.

4 David T se,Pramod Viswanath 'Fundamentals of Wireless Communication', Cambridge University Press,1stedition,2005

5 Wayne Tomasi "Advanced Electronic Communication Systems", -6th edition, Low priced edition-Pearson Education

6 Wayne Tomasi–"Electronic Communication Systems, Fundamentals through Advanced", 5th edition.

7 Kennedy & Davis, "Electronic Communication Systems", IVth edition-TATA McGraw Hill.

DSCELP501: Paper 5:Communication II Lab

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Part - A

1. Study of ASK generation and Detection
2. Study of FSK generation and Detection
3. Study of PSK generation and Detection
4. Second order active filter
5. QPSK modulator and demodulator
6. Determination of V-I Characteristics curve of a Gunn Diode
7. Study of notch filter.
8. Class C tuned amplifier
9. Study of Switched mode regulator using PWM.

*__Any Five experiments from Part - A__

Part- B

Simulation Experiments.

1. Simulate NRZ, RZ, half-sinusoid and raised cosine pulses and generate eye diagram for polar signalling.
2. Pulse code modulation and demodulation system.
3. Computations of the Probability of bit error for coherent binary ASK, FSK and PSK for an AWGN Channel and compare them with their Performance curves.
4. DPSK Transmitter and receiver
5. QPSK Transmitter and Receiver.

*__Any Three experiments from Part B__

DSCEL502: Paper 6 : Embedded Controllers

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Course Objectives:

- To know the importance of microcontrollers and its applications.
- Understand the basics of Embedded Systems hardware and software concepts.
- Acquire knowledge about 8051and PIC Microcontrollers and its peripherals.

Course Outcomes:

- Identify and understand function of different blocks of 8051 microcontrollers.
- Develop program for I/O port operations, Timers, Serial port and Interrupts using C.
- Gain the knowledge to interface LCD, Keyboard, ADC, DAC, DC motor, etc.
- Design and develop small scale embedded systems.

Unit 1 10 Hrs

Introduction to Microprocessors and Microcontrollers: Microprocessor Architecture-Harvard and Van-Neumann Architecture, CISC and RISC processors and their architectures. Difference between microprocessor and microcontroller. Introduction to Embedded Systems, Examples of Embedded Systems, Design Parameters of Embedded Systems, Embedded Software Development Tools: Integrated Development Environment(IDE). Editor, Assemblers, Compilers, linker, loader, Instruction Set Simulator(ISS) Debugging Tools and Techniques, Emulators.

8051 Microcontroller: Architecture, Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

Unit 2 14 Hrs

Instruction set and Interfacing of 8051: Addressing Modes, Instruction set. Simple Assembly language program examples to use the instructions of 8051. Stack and Subroutine instructions. Assembly language Illustrative programs. Timer/counter, serial communication, interrupts and interfacing of 8051.

Unit 3 16 Hrs

PIC18 Microcontrollers: Overview of the PIC microcontroller family, Architecture and features of 18F458, Memory organization, Data memory organization, EEPROM, flash memory, Special Function Registers, Program Counter, Configuration registers, Stack memory, Interrupts, I/O ports, Timers, USART, Capture/Compare/PWM (CCP) Modules, MSSP Serial Port, CAN module, ADC, Special features of the CPU, Oscillator sources. Clock source switching, Instruction set. Watchdog Timer.

Unit 4 20 Hrs

Hardware interfacing and Microcontroller Programming in C: Data types and time delays, Data Serialization in C, Introduction to Communication Protocols – RS 232, I2C, USB, USART, SPI, CAN, and IrDA.

Program ROM allocation, Data RAM allocation, I/O Programming, Timer programming, Automatic Stack operations, Programmer access to the Stack, serial port programming, interrupt programming, generation of PWM signal PWM Motor Control with CCP.

Interfacing to 8051 and PIC: Switch, LED, seven segment LED, Keyboard, LCD, External ADC, DAC interfacing, Stepper motor, DC motor interfacing, Real time clock (RTC) and serial ADC.

Erasing and Writing Flash & EEPROM Memories For Data Storage. Sensor Interfacing and Signal Conditioning Standard.

Reference Books

1. Muhammad Tahir and Kashif Javed, "ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing," 1st Edition, CRC Press, 2017.
2. Kenneth J. Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson / Cengage Learning,1997
3. Muhammad Ali Mazidi and Janice Gillespie and Rollin D, "The 8051 Microcontroller and Embedded Systems using assembly and C,"1st Edition, Pearson, 2006.
4. Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers: Principles and applications", First Edition, Elsevier, 2007.
5. Muhammad Ali Mazidi and Rolin D, Mckinlay, "PIC Microcontroller and Embedded Systems using assembly and C for PIC18," 1stEdition, Pearson, 2008.
6. John Pitman, "Design with PIC Microcontrollers," 1st Edition, Prentice Hall, 1997.

DSCELP502: Paper -6 : Embedded Controllers Lab

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Part -A : Assembly language programming with 8051Microcontroller
(Experiments to be conducted using 8051-kit and simulator)

1. Addition and Subtraction of 8-bit and 16 bit numbers considering carry.
2. To verify the given numbers is prime or not.
3. Finding Largest and Smallest among n numbers.
4. To generate square of a number (1 to 10) using look-up table.

Part – B: Interfacing with 8051 and PIC18F458 Microcontroller
(Programs to be written using C)

1. Interfacing of switch/s and LED/s. a) To read switch status if switch is on, turn on LED or if switch is off, turn off LED. b) To blink the LED with different delay.
2. To interface seven segment LED display and program to implement countdown/up decimal digit 9-0
3. LCD (2X16) interfacing.
4. Interfacing of stepper motor and rotating stepper motor by N steps clockwise / anticlockwise with speed control.
5. Generate square, saw tooth, triangular and staircase waveform using DAC interface.
6. Display of 4- digit decimal number using the multiplexed 7-segment display interface.
7. Analog to digital conversion using internal ADC and display the result on LCD (using Internal ADC in PIC18F458).
8. Interfacing of serial ADC (MCP320x).
9. Speed control of DC motor using PWM (pulse delay to be implemented using timers).
10. To stop/start toggling of LED, when there is an external interrupt.
11. Interfacing of matrix keyboard (4X4).
12. Serial communication between microcontroller and PC.
13. Interfacing of Real Time Clock (DS1307).
14. Interfacing of I^2C based EEPROM/RAM/Flash.

*** All programs from PART-A and any SIX from PART-B**

Sixth Semester Syllabus

DSCEL601: Paper - 7
Electronic Instrumentation and Biomedical Instruments

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Course Objectives:

- Acquire the knowledge of various types of measurement systems and to know the importance of measuring instruments.
- To know different types of errors due to the measurement systems
- Gain the knowledge of working principle of sensors and actuators
- Understand the working principles of data acquisition systems

Course Outcomes:

- Able to calibrate the instruments to minimize measurement errors.
- Use different data acquisition systems to acquire real-time data
- Set up testing strategies to evaluate performance characteristics of different types of data acquisition system and develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

Unit 1 15 Hrs

Measurement System: Introduction to general measurement system, significance of measurements, methods of measurements, instruments and measurement systems, Functions of instruments and measurement systems, Applications of measurement systems.

Instruments Performance Characteristics: Definitions and problems as applicable.

Static Characteristics-Static error, static correction, scale range and scale span, reproducibility and drift, repeatability, Signal to noise ratio, sources of noise, accuracy, precision, linearity, hysteresis, threshold, dead time. Dynamic Characteristics-Fidelity, frequency response, dynamic error, etc.,

Measurement Errors: Introduction, gross errors and systematic errors, absolute and relative errors, basic concepts of accuracy, precision, resolution.

Transducers: Classification of transducers, basic requirement of transducers, principle of operation and construction details of resistive, inductive, capacitive, temperature, ultrasonic, photoelectric, pressure, fiber optic and MEMS based transducers. Measurement techniques for motion, seismic, flow, level, humidity, pH, viscosity.

Unit 2 15 Hrs

Sensors and Actuators: Sensors-Introduction to sensors, types of sensors, typical application of sensors, basic principles and operations of Thermal Sensors, Optical Sensors, Acoustic Sensors, MEMS, Nano-sensors, Ultrasonic Sensors, Thin Film Sensors, Liquid Level Sensors, Magnetic Sensors, Radiation Sensor

Actuators-Introduction to actuators, types of actuators, Logical and Continuous Actuators, Pneumatic actuator, Electro-Pneumatic actuator, cylinder, rotary actuators.

Unit 3 15 Hrs

Bio Potential Electrodes: Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode– skin interface, half cell potential, impedance, polarization effects of electrode – non polarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits.

Electrode Configurations: Bio signals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode.

Bio Amplifier: Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier.

Unit 4 15 Hrs

Measurement Of Non-Electrical Parameter: Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

Reference Books

1 Electronic Instrumentation, H S Kalsi, TMH, 2nd Edition, 2010

2 Electronic Instrumentation and Measurements, David A Bell, PHI/ Pearson Education, 2nd Edition, 2012.

3 Modern Electronic Instrumentation and Measurement techniques, Albert D Helfrick, William D Cooper, PHI, 2007.

4 Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, DhanpatRai& sons, 18th Edition

5 Patranabis D, "Sensors and Transducers", Wheeler publisher, 1994

6 Instrumentation measurement and analysis, Nakra, Choudhary

7 John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

8 Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.

9 Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.

10 Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.

11 Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGra-Hill Publisher 2003

DSCELP601: Paper - 7
Instrumentation and IoT Lab

(Credits: Theory – 04, Practical – 02) **Total Teaching: 60 Hrs**

Hours of Teaching: 4 Hrs / Week

PART-A (Instrumentation Systems Practical)

1. Study of the characteristics of thermistors
2. Study of the characteristics of LDR
3. Study of the piezo electric transducer
4. Construction and study the VI characteristics of solar cell
5. Conversion of basic ammeter into multimeter and calibration of voltage, resistance and current
6. Calibration of thermistors for temperature measurement.
7. Characterize the Temperature sensor (RTD)
8. Simulate the performance of a bio Sensor.
9. Measurement of level in a tank using capacitive type level probe.
10. Characterize the LVDT
11. Design an orifice plate for a typical application.
12. Simulate the performance of a chemical sensor.
13. Characterize the strain guage sensor.
14. Characterize the temperature sensor (Thermocouple).

PART-B (IOT- Lab)

1. Starting Raspbian OS, Familiarization with Raspberry Pi components and interface, Connecting to Ethernet, Monitor, USB.
2. Displaying different LED patterns with Raspberry Pi.
3. Displaying Time over 4-Digit 7-Segment display using Raspberry Pi.
4. Raspberry Pi based Oscilloscope.
5. Controlling Raspberry Pi with WhatsApp.
6. Setting up wireless Access point using Raspberry Pi.
7. Fingerprint Sensor interfacing with Raspberry Pi.
8. Raspberry Pi GPS module interfacing.
9. IoT based Web Controlled Home Automation using Raspberry Pi.
10. Visitor Monitoring with Raspberry Pi and Pi Camera.

***Any five in each part**

DSCEL602: PAPER 8
Internet of Things and Robotics

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Course Objectives:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.
- To acquire the working principle of robots
- Understand the working principle of sensors
- To know the working principles of actuators

Course Outcomes:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.
- Design an embedded system for the working of a robot.
- Select the robot type depending on the application requirements.
- Acquire the basic robot programming skills

Unit 1 15 Hrs

Definition and evolution of the Internet of Things. IoT architecture and components. IoT communication protocols: MQTT, CoAP, HTTP. IoT application domains and use cases. Overview of IoT devices: microcontrollers, sensors, actuators. Types and characteristics of sensors used in IoT applications. Interfacing sensors with microcontrollers. Data acquisition and sensor fusion techniques.

Unit 2 15 Hrs

Wireless communication technologies for IoT: Wi-Fi, Bluetooth, Zigbee, LoRaWAN, NodeMCU and ESP 32 modules - Overview of these modules.

IoT network topologies: star, mesh, and hybrid networks. IoT data management and storage. IoT protocols for device-to-device and device-to-cloud communication. IoT application development platforms and frameworks. Design and implementation of IoT applications. IoT security challenges and solutions. Privacy and ethical considerations in IoT.

Unit 3 15 Hrs

Definitions of Robots: Robotics, Motivation, A Brief History of Robotics, A Robot System, Interdisciplinary Areas in Robots, Classification of Robots, Introduction to embedded system, Understanding Embedded System, Sensors, Classification of sensors(contact & non contact), characteristics of sensors, Touch sensor, Position sensor, optical sensor, IR, PIR, Ultrasonic, temperature, displacement sensor.

Unit 4 15 Hrs

Introduction to Robotics: Getting Started with Programming platform of Robots: Installation of IDE, Pin configuration and architecture of Microcontroller (Atmel series/Arduino), Device and platform features. Concept of digital and analog ports. Familiarizing with Interfacing Board, Introduction to Embedded C platform, Review of Basic Concepts, Arduino data types, Variables and constants, Operators, Control Statements, Arrays Functions, I/o Functions, Pins Configured as INPUT, Pins Configured as OUTPUT, Incorporating time delay() function, delay Microseconds() function, millis() function, micros() function.

Reference Books IOT

1. Internet of Things: Principles and Paradigms by Rajkumar Buyya, Amir, Vahid Dastjerdi, and Anton Y. Dongarra.
2. Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry by MaciejKranz.
3. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, and Robert Barton.
4. Internet of Things with Arduino Cookbook" by Marco Schwartz
5. Arduino Home Automation Projects" by Marco Schwartz and Oliver Manickum
6. Weste, Neil H. E.; Harris, David; Banerjee, Ayan, " CMOS VLSI Design: A Circuits and System Perspective," 3rd Edition, Pearson Education
7. Douglas A. Pucknell and Kamran Eshraghian, "BASIC VLSI DESIGN," 3rd ed.
8. John P. Uyemura, "Introduction to VLSI Circuits and Systems,".
9. Katsuhiko Ogata, Modern Control Engineering, Prentice Hall.
10. Benjamin C. Kuo, Automatic Control Systems, Prentice Hall.

Reference Books Robotics

1. Fundamentals of Robotics by D K Pratihar.
2. Robotics Simplified: An Illustrative Guide to Learn Fundamentals of Robotics, by Dr. Jisu Elsa Jacob, Manjunath N.
3. Introduction to Robotics | Fourth Edition by John Craig.
4. Arduino Robotics by John-David Warren (Author), Josh Adamsduino.

5. Programming in 24 Hours by Richard Blum.
6. Getting Started with Arduino: The Open Source Electronics Prototyping Platform Book by Massimo Banzi and Michael Shiloh.
7. Robotics for Engineers –Yoram Koren, McGraw Hill International, 1st edition, 1985.
8. Robotic Engineering - An Integrated approach, Klafter, Chmielewski and Negin, PHI, 1st edition, 2009
9. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk.

DSCELP 602: Paper - 8:

Project Lab

(Credits: Theory – 04, Practical – 02) **Total Teaching: 60 Hrs**

Guidelines for evaluation of Projects: Project must be completed in the department in the supervision of faculty in charge. It must incorporate the fundamental concepts of Electronics and use the latest tools available to design the need of the problem. Scope for improving the model must be specified in conclusion along with detailed report on the project.
Department must conduct periodical seminars during the allotted lab hours to check the progress of the project. Internal assessment marks of 25 cab be awarded based on the performance of the students in the regular lab hours, Seminar presentations, type of the project and application of the project.

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