JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER

Programme: B.Sc.   **Semester: VI**

ELECTRONICS PAPER VIII (A)
ELECTIVE I - EMBEDDED SYSTEM DESIGN & IOT

Course Code: 18VIEL8A   **No. of Hours: 45**

COURSE OBJECTIVES:
- To understand the basic structure of the Embedded Systems Designing.
- To understand Basic Standard Communication Protocols
- To Understand the Arduino and IOT Environment
- To learn to use loops, control statements, functions, arrays, in programming
- (Arduino programming).
- Interfacing Sensors and Actuators with Arduino.
- To have the knowledge of development of the Embedded Software and Testing

LEARNING OUTCOMES
- Understand basic structures of embedded systems
- Comprehend the principles of Audrino and IOT
- Apply the embedded softwares
- Be proficient in use of IDE's for designing, testing and debugging Embedded systems
- Integrate sensors and actuators with Audrino

UNIT I
INTRODUCTION TO EMBEDDED SYSTEMS   08 HRS
Embedded systems and general purpose computer systems. Architecture of Embedded system. Classifications, major components of an embedded system, Block diagram, Processor embedded into a system, embedded hardware units in a system, applications and purpose of embedded systems. Design process and design examples, Skills required for an embedded system designer.

UNIT II
I/O DEVICES & COMMUNICATION BUSES   10 HRS
I /Os Types - Synchronous serial input, synchronous serial output, Asynchronous Serial input, Asynchronous Serial output, half duplex and full duplex, Examples of Serial I/Os, Parallel Port, Serial-Parallel Output and input, Examples of Parallel I/Os.
Serial Communication Devices: Modes of Communication, Serial Synchronous, Isosynchronous and Asynchronous.
Serial bus Communication Protocols: I2C Bus, CAN Bus, USB, and Firewire –IEEE 1394 Bus standard.
Network Protocols: HTTP, TCP, UDP, IP, Ethernet.
Wireless and Mobile System Protocols: IrDA, Bluetooth, 802.11, Zigbee, Wi-Fi.

UNIT III
INTRODUCTION TO ARDUINO AND IOT 12 HRS
Introduction to Arduino: features, types of Arduino boards. **Arduino Uno board** –
specifications, basic architecture, features of AT mega microcontroller.
Introduction to Arduino Programming: Data types function libraries, operators in arduino,
Control Statement, loops, Arrays, Strings, Math Library. (with basic program).
Introduction to IOT Architecture, M2M, IOT protocols, IOT Applications, IOT Platform
overview, ESP8266 development board specifications.
Trends of different Microcontroller development boards: Raspberry Pi, Adafruit flora,
Beagle bone (mention only).

UNIT IV
INTEGRATION OF SENSORS AND ACTUATORS WITH ARDUINO 10 HRS
Introduction to Arduino IDE, writing, saving, compiling and uploading sketches. Simple analog
and digital input reading with a switch, reading from keypad, reading analog value, getting input
from sensors- Photo-Resistor as Light sensor, Digital Humidity and Temperature Sensor(DHT),
Interface of LCD module, Interface of Servo Motor and Relay.

UNIT V
SOFTWARE CONSIDERATIONS 05 HRS
Software Styles: Round-Robin; Round-Robin with Interrupts; Function-Queue -   Scheduling;
Real-Time Operating System;
Embedded Product Development Life Cycle (EDLC), Integration and Testing of Embedded
Hardware, Testing Methods and Debugging Techniques.

TEXT BOOKS:
1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill. Copyright ©2009.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.3E-Reprint 2009.
3. Programming in ANSI C 4E – E Balagurusamy, Mc Graw Hill.2006.
4. Michael Margolis "Arduino Cook Book" O'Reilly media Inc,2011.

REFERENCE BOOKS:
1. Embedded Systems – Lyla, Pearson, 2013.
2. An Embedded Software Primer - David E. Simon, Pearson Education.2005.
3. Let Us C - Yashwant Kanetkar 5th Edition BPB Publication 2008
4. Book Craft Arduino Projects for Dummies John Wiley & Sons.2005.
5. IOT and Applications – Tenchnial Publications – Iresh A Dhotre.

Assignment:
Student has to learn any one of the Simulation IDE during the Course

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Programme: B.Sc.   **Semester: VI**
ELECTRONICS PAPER VIII (B)
ELECTIVE – II: RENEWABLE ENERGY AND E WASTE MANAGEMENT

Course Code: 18VIELB   **No. of Hours: 45**

COURSE OBJECTIVES:
- To differentiate between conventional and Non-conventional Energy sources.
- To understand the growth of Renewable Energy sectors and its planning in India.
- To understand the efficiency of Solar cells for non-conventional energy source.
- To understand applications of Solar Energy.
- To analyze Wind energy, its potential and installation techniques in India.
- To create awareness of E-waste management and recycling techniques for sustainability.
- To evaluate the importance of Conservation of Environment for sustainable development.
- To formulate the energy audit process.

LEARNING OUTCOMES
- Understand the various types of renewable energy sources namely Solar and wind
- Realize the need for e - waste management and recycling techniques
- Integrate the need for conservation of environment and energy into everyday life

UNIT I
CONVENTIONAL AND NON CONVENTIONAL ENERGY SOURCES   **12 HRS**
Introduction: Causes of Energy Scarcity, Solution to Energy Scarcity, Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India. Environmental Aspects of Energy Utilisation. Potentials – Achievements/Applications – Economics of renewable energy systems. Types of Non conventional Energy sources: Solar, Wind, Tidal, Biomass Energy.

UNIT II
SOLAR ENERGY   **12 HRS**
Solar Radiation – Measurements of Solar Radiation, Solar cells for direct conversion of solar energy into electric power, Solar cell parameter, Solar cell V-I characteristics, Efficiency, single crystal silicon solar cells, Polycrystalline silicon solar cells, Cadmium supplied solar cells, solar panel and solar arrays. Application of solar energy-solar water heating, space heating and space cooling, solar photo voltaic cell, solar green-house.
Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping. Solar PV power plant, Solar PV Power Generation, Net metering concept, Problems.
Solar Thermal Energy Collectors: Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors.

UNIT III
WIND ENERGY   **10 HRS**

Fundamentals of wind energy, Principle of wind energy conversion, factors influencing wind, wind data and Energy estimation, wind speed monitoring, wind resource assessment, Betz limit, site selection, wind energy conversion devices-classification, characteristics, applications, off shore wind energy, Theory of wind turbine, classification of wind turbines (horizontal and vertical axis, lift /drag type; two/three/multi bladed wind turbines). Wind energy potential and installation in India –Repowering concept, Hybrid systems-safety and environmental aspects.

UNIT IV
E-WASTE MANAGEMENT AND RECYCLING TECHNIQUES   08 HRS
Introduction –E-waste,Health Hazards caused by exposure To E-Waste, account of major e-waste toxicants, their source, medium of transfer and major hazards on long term exposure, Recycling Techniques- Electrostatic separation method, Magnetic separation method, advantage of physical recycling methods over chemical, Reuse of Recovered Materials from Waste PCBs.

UNIT V
CONSERVATION OF ENVIRONMENT AND ENERGY AUDIT   03 HRS
Environmental impact of Renewable energy technology, Importance of Conservation, sustainable development, global warming, Energy audit process, Carbon foot print.

TEXT BOOKS FOR REFERENCE:
1. Rai.G.D, "*Non-conventional resources of energy*", 4th edition , Khanna publishers 2010.
2. Khan.B.H,"*Non-Conventional Energy Resources*", The McGraw Hills, 2nd edition, 2009]
3.Godfrey Boyle, *" Renewable energy, power for a sustainable future"* 3rd edition, Oxford University Press 2012,
4.Suhas P Sukhative, *" Solar Energy"*, Tata McGraw Hill publishing Company Ltd.
5. Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi, "*Wind Energy Handbook*", 2nd Edition, John Wiley &Sons ,2011
6.David A Spera, *"Wind Turbine Technology: Fundamental concepts in Wind Turbine Engineering"*, 2nd Edition, ASME Press ,2009

ELECTRONICS
SEMESTER VI
PRACTICAL VIII A / B

PROJECTS HAVE TO BE COMPLETED AS PART OF THE CURRICULUM.
3 HOURS PER WEEK IS ALLOTTED FOR THE PROJECT WORK

PROJECT WORK

➢ Students in a group, not exceeding **THREE**, should design, fabricate and assemble ONE Electronic project in their respective colleges. The department faculty is required to guide the project work.

➢ Each student should prepare a report and submit the report at the time of the practical examination duly certified by the concerned faculty guide & HOD.

➢ Department faculty shall ensure that the entire project work is carried out in their respective colleges by utilizing the practical classes assigned to practical VIII A and B. A seminar on the project work is compulsory.

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