# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

**BEE 041**

## APPLICATION OF IOT IN ELECTRICAL ENGINEERING

**Course Outcomes:**

CO-1 To understand the application areas of IOT ·

CO-2 To design & develop IOT Devices

CO-3 To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·

CO-4 To understand building blocks of Internet of Things and characteristics

CO-5 To understand the interconnection and integration of the physical world & cyber space.

**Unit I**

**Introduction**

Definition, Characteristics of IOT, IOT Conceptual framework , IOT Architectural view, Physical design of IOT, Logical design of IOT, Machine-to-machine(M2M), SDN (software defined networking) and NFV (network functi virtualization) for IOT, data storage in IOT.

**Unit II**

**Design Principles for Web Connectivity:**

Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

**Unit III**

**Sensor Technology**

Participatory Sensing, Industrial IOT and Automotive IOT, Actuator, Sensordata Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Network Technology.

**Unit IV**

**IOT Design methodology:**

Specification-Requirement, process, model, service, functional & operational view. IOT Privacy and security solutions ,RaspberryPi & Arduino devices. IOT Case studies: smart city streetlights control & monitoring.

**Unit V**

**IoT applications to Industries**

IoT applications to PowerSystem, IoT applications to Renewable energy, IoT applications to Power Electronics, Benefits to IoT in electrical field.

**Reference Book:**

1. Rajkamal,"Internet of Things", Tata Mc Graw Hill publication
2. Vijay Madisetti and Arshdeep Bahga,"Internet of things (A-Hand-on-Approach)" 1st Edition ,Universal Press
3. Hakima Chaouchi "The Internet of Things :Connecting Objects",Wiley publication.
4. Charless Bell "My SQL for the Internet of things",A press publications.
5. Francisdacosta "Rethinking the Internet of things: Ascalable Approach to connecting everything" ,1st edition, A press publications 2013.
6. Donald Norris "The Internet of Things: Do-It-Yourself at Home Projects for Arduino,Raspberry Pi and Beagle Bone Black",McGraw Hill publication

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

## BEE 042

## ELECTRICAL MACHINE-I

**Course Outcomes:**

CO-1 Understand the techniques of magnetic-circuit analysis and introduce magnetic materials

CO-2 Summarize the basics of single phase transformers, Determine and interpret efficiency and regulation of a 1 Ph transformer. Operate two single phase Transformers parallel operation.

CO-3 Explain the construction, working, different connections, applications and testing of three phase transformer.

CO-4 Able to analyze different types of DC generators their characteristics, industrial applications, effect of armature reaction and its assessment.

CO-5 Understand the working principles of dc motor types, characteristics, braking and testing.

**Unit –I**

**Magnetic circuits**

Laws governing magnetic circuits,flux linkage, inductance and energy- statically & dynamically induced EMF, Torque production, Hysteresis & Eddy current loss, AC Excitation, introduction of permanent magnets transformer as a magnetically coupled circuit.

**Unit –II**

**Transformer-I**

Single phase transformer Working principle, e.mf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, , Condition for maximum efficiency and regulation.

**Unit –III**

**Transformer-II:**

Three phase transformer: its construction, groups and connections, their working and applications; Scottconnection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather.

**Unit –IV**

**D. C. Generator**:

Law of conservation of energy, electromechanical energy conversion.Principle of operation ,construction and main components, armature winding, Types of winding( lap and wave winding), EMF equation, circuit model, Armature reaction, commutation, compensating windings, Types of DC generators, characteristics and applications, losses and efficiency. Simple numericals.

**Unit –V**

**D. C. Motor**

Principle of operation, production of back& its significance, torque equation. Classification D. C. motors, characteristics of D. C. motors, starters for DC motors, speed control, losses & efficiency, application. Retardation Test, Hopkinson Test, Swimburne's test, PMDC motor, Simple numericals.

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

## LIST OF EXPERIMENTS

1. To Perform turn ratio and polarity test on 1-phasetransformer
2. To obtain equivalent circuit, efficiency & voltage regulation of a single phase transformer by O.C. & S.C. test
3. To obtain efficiency & voltage regulation of a single phase transformer by sumpners test.
4. To obtain magnetization characterstics of a D.C. shunt generator.
5. To obtain load characterstics of a D.C. shunt generator.
6. To obtain load characterstics of a D.C. compound generator.
7. To perform load test of a D.C. series generator.
8. To obtain Speed control of D. C. Shunt motor using- A) armature control
   B) field control method
9. To perform Swinburn's test & obtain efficiency of a DC shunt Machine.
10. To perform Hopkinson's test & determine losses & efficiency of DC Machine.
11. To conduct Brake test on a D.C. shunt motor & to draw the performance curve.
12. To conduct Field test on a given two identical D.C. series machines & to determine efficiency

**Reference Books:-**


1. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., EnglewoodCliffs
2. S K Bhattacharya, Electrical Machines, McGraw-Hill
3. Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co
4. Langsdorf, A.C. Machines, McGraw-Hill
5. Samarajit Ghosh, Electrical Machines, Pearson

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

**BEE 043**

## DIGITAL ELECTRONICS LOGIC DESIGN

**Course Outcomes:**

CO-1 Perform conversions among different number systems, became familiar with basic logic gates.

CO-2 Understand Boolean algebra and simplify simple Boolean functions by using basic Boolean properties &

CO-3 Understand the design of combinational circuits such as MUX, DEMUX, Encoder and Decoder etc.

CO-4 Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters.

CO-5 Obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of Complex Digital electronic Circuits.

**Unit –I**

**Number Systems and Codes:**
Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes.Alphanumeric codes – ASCII code and BCD codes, concept of parity, complementr's& (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes.

**Unit –II**

**Basic Theorems & Properties of Boolean algebra:**
AND, OR, NOT operators, laws of Boolean algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms&Maxterms), sum of minterms& product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator &checkers.

**Unit –III**

**Combinational Circuits:**
Design procedure, Adders (half and Full), subtractor (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, Demultiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram.

**Unit –IV**

**Sequential Logic Circuit :**

Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flipflop.

**Unit –V**

**Registers and Counters** :

Asynchronous and Synchronous counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre- settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

## LIST OF EXPERIMENTS

1. Verification of all the logicgates.
2. Realisaton of boolean expression using 8 x1 multiplexer 74151
3. Verification of functional table of 3 to 8 line Decoder/ Demultiplexer
4. Three variable logic function verification using 8 x 1 multiplexer
5. To verify the truthtable of full adder circuit
6. To verify the functional table of
   A) JK edge triggered flipflop B) JK master-slave flipflop C) D flipflop
7. To Design a 4 bit ring counter using D flipflops / JK flipflops
8. To Design a 4 bit Johnson counter using D flipflops / JK flipflops
9. To verify the operation of 4 bit universal shift register.
10. MOD 8 ripple counter using T flipflops
11. MOD 8 synchronous counter using T flipflops
12. A) Single bit comparator B) Seven segement display circuit using decoder

**References Books:-**


1. A. Anand Kumar, Fundamentals of digital circuits, PHI
2. A K Maini, Digital Electronics, Wiley India
3. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience
4. Jain RP; Modern digital electronics; TMH
5. M Mano; Digital Logic & Computer design; PHI
6. Tocci ; Digital Systems Principle & applications; Pearson EducationAsia
7. Gothmann; Digital Electronics;PHI

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

**BEE 044**

**POWER SYSTEM-I**

**Course Outcomes:**

CO-1 Compare different types of overhead conductors & evaluate line inductance & capacitance.

CO-2 Explain overhead transmission line performance & compensation.

CO-3 Assess knowledge about transposition & skin effect impact of design of transmission line.

CO-4 Categorize cables, their characteristics and understand insulation coordination.

CO-5 Analyze cables on grading, heating and generated losses while working on rated capacity.

**Unit – I**

**Transmission Line Components & Under Ground Cabling:**

Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φ & 3- Φ, Single and double circuit line.

**Unit – II**

**Concept of GMR and GMD:**

Symmetrical & asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground or capacitance, Capacitance calculation for symmetrical and asymmetrical 1-phase and three phase.

**Unit – III**

**Single and double circuit line :**

Single and double circuit line configuration, Charging current, Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor.

**Unit – IV**

**Underground Cable I**:

Underground Cable Comparison of cables and overhead transmission lines, Classification of cables, requirement of cable construction, capacitance of single and multi-core cable, economic core diameter, dielectric stress in cable.

**Unit – V**

**Underground Cable II**:

Grading of cables, ionization of Heating of cables, Phenomena of dielectric losses and sheath loss in cables, Thermal resistance of cables

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

## LIST OF EXPERIMENTS

1. To study various components of power systems.
2. To study various types of conductors used in power system.
3. To determine the line parameters L and C per phase per km of a single-phase system.
4. To determine the line parameters L and C per phase per kilometer of a three-phase symmetrical transmission system.
5. To determine the line parameters L and C per phase per kilometer of a three-phase line with bundled conductors.
6. To study the corona loss in power distribution system..
7. To study Ferranti effect in a model of transmission line.
8. To study the proximity and skin effect.
9. To study construction of underground cable.
10. To calculate dielectric stress in cable.

**Reference Books:**

1. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.

2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.

3. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

**BEE 045**

## ELECTROMAGNETIC FIELD & MATERIALS

**Course Outcomes:**

CO-1 Apply vector calculus to understand the behavior of static electric fields in standard configurations.

CO-2 Apply vector calculus to understand the behavior of static magnetic fields in standard configurations.

CO-3 Describe and analyze electromagnetic wave propagation in free-space.

CO-4 To introduce the concepts of electric field, magnetic field theory for power transmission lines

CO-5 Applications of electric and magnetic fields in the development of the theory for power transmission lines.

**UNIT:- I**

**Coulomb's Law And Electric Field Intensity** -The Experimental law of Coulomb; Electric Field Intensity; Field Due to a Continuous Volume Charge Distribution; Field of a Line Charge; Field of a Sheet of Charge.

**Electric Flux Density, Gauss's Law And Divergence**-Electric Flux Density; Gauss's Law; Divergence; Maxwell's First Equation (Electrostatics); The Vector Operator & the Divergence Theorem.

**UNIT:- II**

**Energy And Potential**- Energy Expended in Moving a Point Charge in an Electric Field; The Line Integral; Definition of Potential Difference and Potential; The Potential Field of a Point Charge; The Potential Field of a System of Charges: Conservative Property; Potential Gradient; Energy Density in the Electrostatic Field

**Current And Conductors, Dielectrics And Capacitance** -Current and Current Density; Continuity of Current; Metallic Conductors; Conductor Properties and Boundary Conditions. Boundary Conditions for Perfect Dielectric Materials; Capacitance; Examples.

**UNIT:- III**

**Poisson's And Laplace's Equations** -Derivation of Poisson's and Laplace's Equations; Uniqueness Theorem; Examples of Solution of Laplace's Equation; Example of Solution of Poisson's Equation.

**UNIT:- IV**

**The Steady Magnetic Field** -Biot-Savart Law; Ampere's Circuital Law; Curl; Stoke's Theorem; Magnetic Flux and Magnetic Flux Density; The Scalar and Vector Magnetic Potentials.

**Magnetic Forces, Materials And Inductance** -Force on a Moving Charge; Force on a Differential Current Element; Force Between Differential Current Elements; Force and Torque on a Closed Circuit; Magnetization and Permeability; Magnetic Boundary Conditions; The Magnetic Circuit; Potential Energy and Forces on Magnetic Materials; Inductance and Mutual Inductance.

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

**UNIT:- V**

**Time-Varying Fields And Maxwell's Equations -**Faraday's Law; Displacement Current; Maxwell's Equations in Point Form; Maxwell's Equations in Integral Form; The Retarded Potentials.

**References Books:**


1. Engineering Electromagnetics, W. H. Hayt and J. A. Buck, Seventh Edition, Tata McGraw Hill, 7 th Edition, 2012.
2. II. Electronic Communication Systems, George Kennedy and Bernard Davis, Fourth Edition, Thirty-fifth Reprint (2008), Tata McGraw Hill Publishing Company Ltd.
3. Elements of Engineering Electromagnetics, Nannapaneni Narayana Rao, 6th Edition, Pearson Education Low Price Edition.

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

## BEE 046(P)

## Computer Programming-II ( JAVA)

**Course Outcomes:**

CO1: Understand and implement object-oriented features of Java.
CO2: Represent data in various Data Structures, organize data in various ways using different collection algorithms
CO3: Implement the concept of thread Organize data in various ways using different collection algorithms.
CO4: Implement the concept of thread. Implement the concept of Database connectivity & networking in Java
CO5: Understand basic architecture of different Web Technologies of Java. Implement Internet programming in Java.

**Contents:**

- C language alphabet set, identifiers, Variables and constants Data types, Builtin and user Defined Data types Arrays operators and expressions Simple assignment and Input-output statements, preprocessor directives writing simple ‘C’ programs, compiling and executing ‘C’ Programs.
- Conditional statements and loops: IF statement IF–ELSE statement, SWITCH statement, FOR statement, WHILE and Do WHILE statement.
- Function: Function declaration or prototype. Function definition, function calling: call by value, call by reference, Recursion.
- Introduction to pointers, File processing: concept of files, file opening, editing, reading and writing.

**Lab assignments :**

1. Design and execute a ‘JAVA’ program for multiplying two n Xnmatrics.
2. Design a ‘JAVA’ program to calculate Average of ‘n’ numbers.
3. Design a ‘JAVA’ program to add two numbers using call by value parameter passing mechanism.
4. Design a ‘JAVA’ program to swap the contents of two variables using call by reference parameter passing mechanism.
5. Design a ‘JAVA’ program to open a file and add contents to modify the file.

**Reference Books :**

1. Programming in ANSI C, by Balagurusamy, Tata McGraw Hill
2. The C programming Language. By Brian W. Kernighan and Dennis M. Ritchie. Published by Prentice-Hall
3. Let us C by Y.Kanetkar, BPB Publication

# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 4th ACADMIC SESSION 2024-25

## SKILL BASED TRAINING PROGRAM

## KEIL SOFTWARE

### Course Objectives

1. To program both 8051 to meet the requirements of the user.
2. To interface various peripherals
3. To handle interrupts
4. To design a microcomputer to meet the requirement of the user
5. Interfacing of 8-bit ADC0809 with 8051 Microcontroller.

A syllabus for Keil Software (often used for programming microcontrollers, especially with ARM-based processors) can be broken into five units. The focus will be on introducing students to embedded systems programming using the Keil IDE (Integrated Development Environment) and tools like ARM Cortex-M microcontrollers.

### Unit 1: Introduction to Keil Software and Embedded Systems

Overview of Embedded Systems and Microcontrollers, Introduction to Keil MDK (Microcontroller Development Kit), IDE components: µVision, Debugger, ARM Compiler, Installation and setup of Keil MDK, ARM Architecture Overview (e.g., ARM Cortex-M series), Understanding Microcontroller Specifications (Datasheets and Pin Diagrams), Writing and Running a Basic Program in Keil, Configuring a project in Keil for a specific microcontroller "Hello World" program: Blinking an LED using GPIOs.

### Unit 2: Programming Basics in Keil

C Programming Basics for Embedded Systems, Data types, Control Structures, and Functions, Working with Libraries and Header Files, Using GPIOs (General-Purpose Input/Output), Input and Output Configurations, Interfacing Switches and LEDs, Working with Timers and Counters, Introduction to timers in microcontrollers, Creating delays using timers, Generating PWM (Pulse Width Modulation) signals

### Unit 3: Peripheral Interfacing and Communication Protocols

Introduction to Serial Communication Protocols, UART, I2C, and SPI: Overview and Differences, Implementing UART Communication in Keil, Sending and receiving data through UART, Interfacing a serial terminal with a microcontroller, I2C and SPI Communication in Keil, Communicating with sensors and displays using I2C/SPI, Interfacing an LCD or OLED display ADC (Analog to Digital Converter) and DAC (Digital to Analog Converter), Configuring and using ADC for reading sensor data, Displaying ADC data on a serial terminal.

**Unit 4: Advanced Programming and Debugging in Keil**

Using Keil Debugging Tools, Breakpoints, Watch Windows, & Step-Through Debugging, Understanding Memory Management (RAM, ROM, Stack), Interrupts and Exception Handling, Configuring External Interrupts (e.g. using buttons), NVIC (Nested Vectored Interrupt Controller) in ARM Cortex-M, Working with RTOS (Real-Time Operating Systems) Introduction to RTOS concepts: Tasks, Semaphores, and Queues Using Keil RTX for simple RTOS-based programs, Power Management Techniques for Embedded Systems, Sleep Modes & Low Power configurations

**Unit 5: Project Development and Optimization**

Project Development Process, Planning, Designing, and Prototyping a Project, Code Structuring and Documentation Practices, Code Optimization Techniques, Reducing Memory Footprint and Execution Time, Optimizing Power Consumption in Embedded Applications, Case Studies and Real-World Applications, Examples of embedded system projects using Keil, Applications in Automotive, IoT, and Home Automation, Final Project: Design and Implement a Microcontroller-based System, Examples: Temperature Logger, Smart Home Controller, Remote Sensor System, Presentation and Demonstration of the Project, Recommended Resources, Keil MDK official documentation and user guides, ARM Cortex-M microcontroller datasheets and reference manuals, Embedded C programming books and online tutorials

**LIST OF EXPERIMENTS:**

1. Study and familiarization of 8051 Microcontroller trainer kit.
2. Assembly Language Program for addition of 8-bitnumbers stored in an array.
3. Assembly Language Program for Multiplication by successive addition of two 8-bitnumbers.
4. Assembly Language Program for finding largest no. from a given array of 8-bit numbers.
5. Assembly Language program toarrange8-bitnumbers stored in an array in ascending order.
6. Stepper motor control by 8051 Microcontroller.
7. Interfacing of 8-bit ADC0809 with 8051 Microcontroller.
8. Interfacing of 8bit DAC0800 with 8051 Microcontroller & Waveform generation using DAC.
9. Implementation of Serial Communication by using 8051serial ports.
10. Assembly Language Program for use of Timer/Counter for various applications.
11. Traffic light controller/Real-time clock display
12. Simple test program using ARM9 mini 2440 kit (Interfacing LED with ARM9 mini 2440 kit)