MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. I Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2280121	**DC**	Introduction to Artificial Intelligence & Machine Learning	50	10	20	20	-	-	-	100	4	-	-	4	Blended	MCQ	1.5 Hrs
2.	2280122	**DC**	Computer Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	2280123	**DC**	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	2250100	**BSC**	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
5.	2100022	**ESC**	Basic Electrical & Electronics Engineering	50	10	20	20	40	30	30	200	2	1	2	4	Blended	MCQ	1.5 Hrs
Total				**250**	**50**	**100**	**100**	**80**	**60**	**60**	**700**	**13**	**04**	**04**	**19**	-	-	-
6.	3000001	**Natural Sciences & Skills**	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
04	-	13	02	07	03	07	02	19
21.05%	-	68.42%	10.53%	36.84%	15.79%	36.84%	10.53%	Credits %

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
2280121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To provide the most fundamental knowledge to the students so that they can understand what the AI is.
- To present the basics of Artificial Intelligence (AI) and machine learning (ML).
- To investigate applications of AI and ML techniques in social media analysis, mobile and IoT analysis, time series analysis, artificial neural networks and other machine learning models.

Unit I

Artificial Intelligence: Introduction, History of AI, AI Problem, Approaches, Goals, Purpose, Scope, Terminology, and Application Areas, Industrialization and its Impact, Cyber-Physical System, Evolution of Industry, Data Availability, Relation between Artificial Intelligence, Machine Learning, Deep Learning and other Related Fields.

Unit II

Conventional vs Machine Learning Programming, Data/Information/Knowledge, Type of Data: Structure, Non Structure, Semi Structure, Images, Video, Temporal, Real Time. Data Types: Categorical/Nominal/Ordinal, Data Types Conversion, Model, Algorithm, Model Development Life Cycle, Learning, Training, Testing, Validation, Importance of Data, AI Tools for Implementation.

Unit III

Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Categorical and Continuous Data, Skewness and Correlation, Regression Analysis Vs Classification. Supervised Learning: Linear and Logistic Regression: Linear models for classification, Sigmoid, Logistic regressions with single and multiple variables, Polynomial regression.

Unit IV

Unsupervised Learning: Clustering, Common distance measures, Hierarchical algorithms – agglomerative and divisive, partitioning algorithms – k-means and derivatives; Design and Analysis of Machine Learning Experiments: Guidelines for machine learning experiments, Factors, Response, and Strategy of experimentation, Cross-Validation and Resampling methods, measuring classifier performance.

Unit V

Artificial Intelligence and Machine Learning in Real World: Speech Processing, Natural Language Processing, Planning, manufacturing industry, logistic industry, retail industry. AI and DS in Healthcare, Defense and Agriculture, Cyber Security, Agriculture, E-Commerce, Finance, Smart Devices.

RECOMMENDED BOOKS

- Artificial Intelligence A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
- Fundamentals of Artificial Intelligence by K. R. Chowdhary, Springer.
- E. Alpaydin, Introduction to Machine Learning (3rd ed.), PHI, 2015. ISBN 978-8120350786.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define basic concepts of Artificial Intelligence.

CO2. relate various computer components used in Artificial Intelligence.

CO3. learn about and practice a variety of Supervised and Unsupervised Learning approaches.

CO4. familiarize and learn about the latest trends and research in the field.

CO5. understand the real world problems and applications of AI and ML for solving the problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER PROGRAMMING
2160122/2230122/2240122/2270122/2280122

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To study the concepts of procedural and object oriented programming.
- To design and implement basic programming solutions using programming constructs.

Unit I

Introduction to Programming, Types of Computer Programming Languages, Program Execution and Translation Process, Problem Solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, Variables, Input/Output, Operators & Expressions, Precedence of Operators.

Unit II

Control Statements and Decision Making: goto statement, if statement, if-else statement, nesting of if statements, switch statement, while loop, do...while loop, for loop, nesting of for loops, break and continue statement. Function Basics, Function Prototypes, Passing Parameter by Value and by Reference, Default Arguments, Recursion. Arrays: One Dimensional Arrays, Multidimensional Arrays, Passing Arrays to Functions.

Unit III

Strings, Pointers, Structures and File Handling: Operations on Strings, Basics of Pointers & Addresses, Reference Variable, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings. Dynamic Memory Allocation using New and Delete Operators. Structures & Union, Pointer to Structure, Self-Referential Structures. File Concepts, Study of Various Files and Streams, Operations on Files.

Unit IV

Object Oriented Paradigm, Features of OOPS, Comparison of Procedural Oriented Programming with Object Oriented Programming, Abstract Data Types, Specification of

Class, Visibility Modes, Defining Member Functions, Scope Resolution Operator, Constructors, its types, and Destructors, Creating of Objects, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Friend Function.

Unit V

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam.
- Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES

After completing this, the students will be able to:

CO1. identify situations where computational methods and computers would be useful.

CO2. develop algorithms and flowchart for a given problem.

CO3. understand the concepts of procedural programming.

CO4. explain the concepts of object oriented programming and its significance in the real world.

CO5. analyze the problems and choose suitable programming techniques to develop solutions.

CO6. develop computer programs to solve real world problems.

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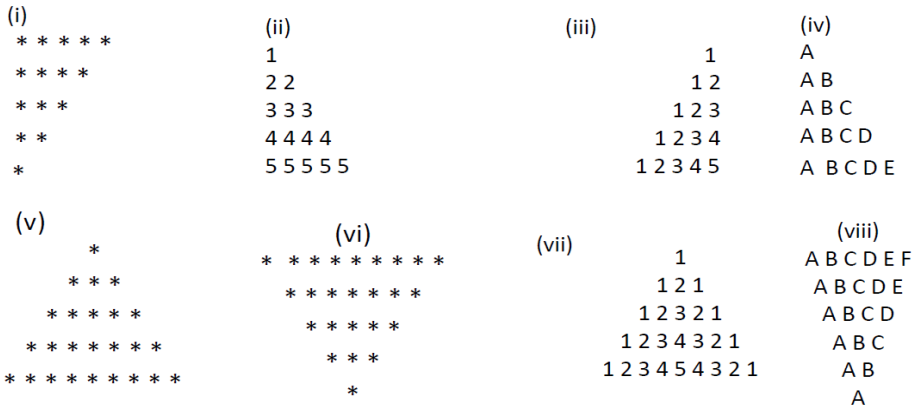
DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER PROGRAMMING
2160122/2230122/2240122/2270122/2280122

LIST OF PROGRAMS

1. Write a program to add two numbers and display its sum.
2. Write a Program to calculate and display the volume of a cylinder for height and radius parameters to be input from the user.
3. Write a program to realize the following expressions:
   a. V = u + at
   b. S = ut+1/2a
   c. T=2*a+√b+9c
4. Write a program to take input of name, rollno and marks obtained by a student in 5 subjects of 100 marks each and display the name, rollno with percentage score secured.
5. Write a program to swap values of two variables with and without using the third variable.
6. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
7. Write a program to find the largest of three numbers using ternary operators.
8. Write a program to find the roots of quadratic equation.
9. Write a Program to Check Whether a Number is Prime or not.
10. Write a program to compute the grade of students using if else ladder as per MITS norms.
11. Write a program to check whether the entered year is leap year or not (a year is leap if it is divisible by 4 and divisible by 100 or 400.)
12. Write a program to print the sum of digits of a number using for loop.
13. Write a program to display the following pattern using for loops.



14. Write a program to calculate factorial of a number using recursion.

15. Write a program to add two matrices of the same order.

16. Write a program to add two complex numbers, use structure data-type to represent complex numbers.

17. Write a program to create 10 objects of a student class containing the student's name, ID, Semester and CGPA as data members, and getDetails(), setDetails() as member functions. The class should also contain static variables which keep track of the student with maximum CGPA in each semester. The class should also contain a constructor to initialize the data members.

COURSE OUTCOMES

After completing this, the students will be able to:

CO1. apply basic programming concepts .

CO2. develop algorithms and flowchart for a given problem.

CO3. illustrate the concepts of procedural programming.

CO4. implement the concepts of object oriented programming.

CO5. design suitable programming solutions using procedural/object oriented programming paradigms.

CO6. develop computer programs to solve real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER PROGRAMMING
2160122/2230122/2240122/2270122/2280122
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Two strings A and B are given, each consisting of lower case alphabets. Write a program to find whether it is possible to choose some non-empty strings s1 and s2 where s1 is a substring of A, s2 is a substring of B such that s1 + s2 is a palindromic string. Here '+' denotes the concatenation between the strings, and if there are such strings S1 and S2 then print S1+S2.

2. Following conditions are given based on three subjects marks:
    a. Physics marks must be greater than 80
    b. Chemistry marks must be greater than 80
    c. English marks must be greater than 70

    Students are awarded grade 10 if all three conditions are met. Grade 9 is given if conditions a and b are met. Grade 8 is given if conditions b and c are met. Grade 7 is given if a and c are met. Grade is 6 if only one condition is met . Grade is 5 if none of the three conditions are met. Write a program to display the grade of students, based on the values of physics, chemistry and English, given by the user. Also, display the calculated grade only if the overall marks (out of 300) are greater than 32%, otherwise display ‘the student is Fail’.

List of Macro Projects:

1. Design a flowchart to implement the Tic-Tac-Toe game and hence implement the same using C++.
2. Write a program in C++ that implements the operations performed by an ATM. The operations include: Balance check, Withdraw Cash, Deposit cash etc.
3. Create a login module using C++ with below mentioned features:
    a. Verify username and password correctly.
    b. Register new user and set its password.
    c. Change password of any registered user.

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of Mini Projects:

1. Library Systems is aimed to computerize the library management operations, e.g. Registering a Student, Issuing a book, Handling Book Return, etc. Write a program in C++ which implements these operations.
2. A Question Bank System computerized the MCQ based exams. It takes input from a file having questions, presents them randomly before the examinee, counts time to complete the exam and finally presents the marks obtained. Use OOPS concepts to implement the question bank system.
3. Design a Student Record Management System in C++ which maintains the personnel as well as academic record of students and provides various options for searching a student in the system.
4. Ram and Shyam are playing a game. Ram initially has the number **A** and Shyam has the number **B**. There are a total of **N** turns in the game, and Ram and Shyam alternatively take turns. In each turn the player whose turn it is, multiplies his or her number by 2. Ram has the first turn. Suppose after all the **N** turns, Ram's number has become **C** and Shyam's number has become **D**. Write a program to calculate the integer division of the maximum number among **C** and **D** by the minimum number among **C** and **D**.
5. There's an array A consisting of N non-zero integers $A_{1..N}$. A subarray of A is called alternating if we take any two adjacent elements in it , then one of them should be even and the other should be odd. For each x from 1 to N, write a program to compute the length of the longest alternating subarray that starts at x - that is, a subarray $A_{x..y}$ for the maximum possible $y \geq x$. The length of such a subarray is $y-x+1$.
6. Given an array $A_1, A_2, ..., A_N$, count the number of subarrays of array A which are non-decreasing. A subarray A[i,j], where $1 \leq i \leq j \leq N$ is a sequence of integers $A_i, A_{i+1}, ..., A_j$. A subarray A[i,j] is non-decreasing if $A_i \leq A_{i+1} \leq A_{i+2} \leq ... \leq A_j$. Write a program to count the total number of such subarrays.
7. Two strings A and B are given, each consisting of lower case alphabets. Write a program to find whether it is possible to choose some non empty strings s1 and s2 where s1 is a substring of A, s2 is a substring of B such that s1 + s2 is a palindromic string. Here '+' denotes the concatenation between the strings. And if there are such strings S1 and S2 then print S1+S2.
8. There are N students standing in a row and numbered 1 through N from left to right. You are given a string S with length N, where for each valid i, the i-th character of S is 'x' if the i-th student is a girl or 'y' if this student is a boy. Students standing next to each other in the row are friends .The students are asked to form pairs for a project. Each pair must consist of a boy and a girl. Two students can only form a pair if they are friends. Each student can only be part of at most one pair. Write a program to find the maximum number of pairs that can be formed.
9. Following conditions are given based on three subjects marks
    a. Physics marks must be greater than 50

b. Chemistry marks must be greater than 80
c. English marks must be greater than 70

Students are awarded grade 10 if all three conditions are met. Grade 9 is given if conditions a and b are met. Grade 8 is given if conditions b and c are met. Grade 7 is given if a and c are met. Grade is 6 if only one condition is met . Grade is 5 if none of the three conditions are met. Write a program to display the grade of students , based on the values of physics, chemistry and English, given by the user. Use object oriented programming to implement the system.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DIGITAL LOGIC DESIGN
2160123/2230123/2240123/2270123/2280123

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To understand the fundamental operating components of Digital Computers.
- To learn various number systems, boolean algebra employed in digital computers.
- To understand the concepts of counters, latches and flip-flops.

Unit I

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

Unit II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications.

Unit III

Combinational Circuits, Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers.

Unit IV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

Unit V

Introduction to Memory, Memory Decoding, Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Sequential Programmable Logic Device (SPLD), Complex Programmable Logic Device (CPLD), Field-Programmable Gate Array (FPGA), Digital Logic Design: RTL and DTL Circuits, TTL.

RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
- Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain the basic components and functional units to define computer architecture

CO2. explain different number systems and basic operations employed at machine level.

CO3. develop the understanding of combinational circuits.

CO4. analyse the basic concept of sequential circuits.

CO5. compare and differentiate various memories used in Computers.

CO6. reduce the boolean functions to mitigate hardware complexity issues.

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DEPARTMENT OF INFORMATION TECHNOLOGY

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
2100022

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To impart the basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer and its terminology.
- To make familiarize the students about the working of rotating electrical machine, various electronic circuits and its importance.

Unit I

D.C. Circuits Analysis: Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit II

Single-phase AC Circuits: Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.

Unit III

Magnetic Circuits: Basic definitions, AC excitation in magnetic circuits, self-inductance and mutual inductance, Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Flux,MMF and their relation, analysis of magnetic circuits.

Unit IV

Single-phase Transformer &Rotating Electrical Machines: Single phase transformer, Basic concepts, construction and working principal, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.

Unit V

Digital Electronics, **Devices & Circuits:** Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates- symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations.

RECOMMENDED BOOKS

- Basic Electrical and Electronics Engineering, D.P. Kothari & I.J. Nagrath-Tata McGraw Hill
- Basic Electrical and Electronics Engineering, V N Mittle & Arvind Mittal -Tata McGraw Hill
- Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
- Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
- Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall.
- Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH
- Integrated Electronics- Millmann & Halkias
- Electronics Devices & circuits- Sanjeev Gupta, Dhanpat Rai Publication.
- Basic Electrical and Electronics Engineering, D.C Kulshreshtha-Tata McGraw Hill

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COURSE OUTCOMES

After completion of the course students would be able to:

CO 1. solve DC & AC circuits by applying fundamental laws & theorems

CO 2. compare the behavior of electrical and magnetic circuits for given input

CO 3. explain the working principle, construction, applications of rotating electrical machines

CO 4. explain the working principle, constructional details, losses & applications of single phase transformer.

CO 5. select the logic gates for various applications in digital electronic circuits.

CO 6. explain characteristics of diode and transistor.

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DEPARTMENT OF INFORMATION TECHNOLOGY

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (100022)

LIST OF PROGRAMS

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem.
3. To determine resistance inductance of a choke coil.
4. To determine active reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.

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DEPARTMENT OF INFORMATION TECHNOLOGY

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (100022)
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Study of voltage and current source.
2. Study of various loads in electrical circuits.
3. Study of resistance and inductance.
4. Study of capacitance and inductance.
5. Study of energy and power in an arbitrary circuit.
6. Study of electrical switch.
7. Study of EM induction theory.
8. Study of hazard while electrical circuit dealing.
9. Study of energy and power meters.

List of Macro Projects:

1. Study of current and voltage mathematical representation.
2. Identify the various electrical loads in household applications.
3. Identify and draw the circuit diagram of FTL.
4. Study of circuit response of RC network.
5. Differentiate energy and power of a RL circuit.
6. Construction of different types of electrical switches.
7. Study of EM induction in DC and AC motors.
8. Study of electrical safety norms.
9. Identification and differentiate the digital and analog energy/ power meters.

List of Mini Projects:

1. Enlist the different electrical loads available in your home and prepare their rating chart.
2. Design the residential house wiring using fuse, switch, and indicator, lamp and energy meter. Also apply the Thevenin's theorem for finding the current in a particular branch of the circuit.
3. If one FTL (Fluorescent Tube Light) is replaced by LED bulb. Calculate the Monthly electrical energy saving? Calculate the monthly savings in electricity bill?
   Note: LUX level of FTL and LED bulbs must be the same (follow BEE Guidelines). Consider electricity bill charges from MP Vidyut Vitran company website.