BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. (Electrical & Computer): Semester –I (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	BSC		Engineering Mathematics- I	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	BSC		Engineering Physics	3	2	-	60	40	50	-	-	150	3	1	-	4
3.	ESC		Fundamentals of Electrical Engineering	4	2	-	60	40	50	-	-	150	4	1	-	5
4.	ESC		Computer Architecture	4	-	-	60	40	-	-	-	100	4	-	-	4
5.	PCC		Solid State Devices & Electronic Circuits	4	2	-	60	40	50	-	-	150	4	1	-	5
6.	HSMC		Universal Human values	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	SBC		Skill based Course-I Computer Programming -I	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**18**	**12**	**1**	**300**	**200**	**225**	**-**	**25**	**750**	**18**	**6**	**1**	**25**

B. Tech. (Electrical & Computer): Semester – II (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	BSC		Engineering Mathematics- II	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	BSC		Engineering Chemistry	3	2	-	60	40	50	-	-	150	3	1	-	4
3.	ESC		Java Programming	4	2	-	60	40	25	-	-	125	4	1	-	5
4.	ESC		Classic Data Structures	3	2	-	60	40	25	-	-	125	3	1	-	4
5.	PCC		Instrumentation & Measurements	4	2	-	60	40	50	-	-	150	4	1	-	5
6.	HSMC		Communication Skills	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	SBC		Skill based Course - II Computer Programming -II	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**17**	**14**	**1**	**300**	**200**	**225**	**-**	**25**	**750**	**17**	**7**	**1**	**25**

B. Tech. (Electrical & Computer): Semester – III (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	PCC		Power System Engineering	3	-	-	60	40	-	-	-	100	3	-	-	3
2.	PCC		Electrical Machines	3	2	1	60	40	25	25	-	150	3	1	1	5
3.	PCC		Computer Network & Communication	3	2	-	60	40	50	-	-	150	3	1	-	4
4.	PCC		Operating Systems	3	2	-	60	40	25	-	25	150	3	1	-	4
5.	PCC		Network Analysis	3	2	1	60	40	50	-	-	150	3	1	1	5
6.	SBC		Skill based Course –III- Computer Aided Design	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**15**	**12**	**2**	**300**	**200**	**175**	**25**	**50**	**750**	**15**	**6**	**2**	**23**
7.	*MOOC		MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	**2**
8.	**VAC		Value Added Course - I	-	2	-	-	40	-	-	-	0	0	1	0	1

*** Indicate this is mandatory but the credits will not be considered in SGPA/CGPA.(As and when the students complete the course and submit the certificate, it should be reflected in the marksheet. The student should clear the subject up to 7th Sem of his/her coursework.)**
**** indicate this is mandatory but the credits will not be considered in SGPA/CGPA**

B. Tech. (Electrical & Computer): Semester – IV (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	PCC		Machine Learning	3	-	-	60	40	-	-	-	100	3	-	-	3
2.	PCC		Special Purpose Machines	3	2	1	60	40	25	-	25	150	3	1	1	5
3.	PCC		Web Designing	3	2	-	60	40	50	-	-	150	3	1	-	4
4.	PCC		Power Electronics	3	2	-	60	40	25	-	25	150	3	1	-	4
5.	PCC		Database Management Systems	3	2	-	60	40	25	-	25	150	3	1	-	4
6.	SBC		Skill based Course -IV Mobile Application Development	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**15**	**12**	**1**	**300**	**200**	**150**	**-**	**100**	**750**	**15**	**6**	**1**	**22**
7.	*MOOC		MOOC-II	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

*** Indicate this is mandatory but the credits will not be considered in SGPA/CGPA. (As and when the students complete the course and submit the certificate, it should reflect in the marksheet. The student should clear the subject up to 7th Sem of his/her course.)**

B. Tech. (Electrical & Computer): Semester – V (2023 COURSE)

Sr. No.	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	PCC		Industrial Control System	4	2	-	60	40	25	-	25	150	4	1	-	5
2.	PCC		Industrial Automation	4	2	-	60	40	25	-	25	150	4	1	-	5
3.	PCC		Advanced Microcontroller & Applications	3	2	-	60	40	50	-	-	150	3	1	-	4
4.	PCC		Deep Learning	3	-	-	60	40	-	-	-	100	3	-	-	3
5.	PCC		Cloud Computing	3	2	-	60	40	25	-	25	150	3	1	-	4
6.	SBC		Skill based Course –V-Application Software in System Analysis	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**17**	**12**	**-**	**300**	**200**	**150**	**-**	**100**	**750**	**17**	**6**	**-**	**23**
7.	**MAC		Environmental Studies	-	-	-	-	-	-	-	-	-	-	-	-	-

**** indicate this is mandatory but the credits will not be considered in SGPA/CGPA**

B. Tech. (Electrical & Computer): Semester – VI (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	PCC		Parallel Computing	3	-	-	60	40	-	-	-	100	3	-	-	3
2.	PCC		Power System Modeling & Analysis	3	2	-	60	40	25	25	-	150	3	1	-	4
3.	PCC		Protection of Power System Components	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	PEC		PEC-I	3	2	-	60	40	50	-	-	150	3	1	-	4
5.	PCC		Data Analytics	3	2	-	60	40	25	-	-	125	3	1	-	4
6.	HSMC		Professional Skills	-	2	-	-	-	25	-	-	25	-	1	-	1
7.	SBC		Skill based Course –VI- Solar Power Plant Designing	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**15**	**14**	**-**	**300**	**200**	**175**	**25**	**50**	**750**	**15**	**7**	**-**	**22**
8.	**VAC		Value Added Course - II	-	2	-	-	40	-	-	-	-	-	1	-	1

**** indicate this is mandatory but the credits will not be considered in SGPA/CGPA**

B. Tech. (Electrical & Computer): Semester – VII (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	PCC		Robotics & Automation	3	-	-	60	40	-	-	-	100	3	-	-	3
2.	PCC		Power System Stability & Control	3	2	-	60	40	25	-	25	150	3	1	-	4
3.	PCC		Industrial Drives & Applications	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	PEC		PEC-II	3	2	-	60	40	25	-	25	150	3	1	-	4
5.	Project		Project Stage -I	-	2	-	-	-	100	-	50	150	-	4	-	4
6.	*Internship		Internship	-	-	-	-	-	25	-	25	50	-	4	-	4
			Total	**12**	**8**	**-**	**240**	**160**	**200**	**-**	**150**	**750**	**12**	**11**	**-**	**23**

***Internship will be of 60 days. It should be done after VI th Semester Examination is over.**

B. Tech. (Electrical & Computer): Semester – VIII (2023 COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	PCC		Power Quality Issues & Mitigation Techniques	3	2	-	60	40	25	-	25	150	3	1	-	4
2.	PCC		Information & Network Security	3	2	-	60	40	25	-	25	150	3	1	-	4
3.	PEC		PEC-III	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	Project		Project Stage-II	-	4	-	-	-	150	-	100	250	-	8	-	8
5.	SBC		Skill base Course –VII- Software Testing	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**9**	**12**		**180**	**120**	**250**	**-**	**200**	**750**	**9**	**13**	**-**	**22**

Program Elective Course (PEC) List

Sr. No.	Semester-VI	Semester-VII	Semester-VIII
	PEC-I	**PEC-II**	**PEC-III**
1	Advanced Programming	Human-Computer Interaction	Computer Aided Power System
2	PHP	Software Project Management	High Voltage Engineering
3	Computer Graphics and Visualization	Software Testing and Quality Assurance	EV integrated Power System

Minor Degree: Total Credit: 20

Sr. No.	Semester	Minor-1 (Electric Vehicle)	Minor-2 (Sustainable Energy Management)	Minor-3 Artificial Intelligence & Machine Learning (AI&ML)	Minor-4 (Data Science)	Credit
01	**III**	Electric & Hybrid Vehicles	Fundamentals of Energy Engineering	Maths for Machine Learning	Fundamentals of Probability & Statistics	**5**
02	**IV**	EV batteries & Charging system	Energy Conservation & Audit	Introduction to image processing	Python for Data Science	**5**
03	**V**	Electric Drives and Controls for Electric Vehicles	Energy Storage systems for Renewables	Neural Networks	Business Intelligence	**5**
04	**VI**	Testing and Certification of Electric Hybrid Vehicles	Sustainable Energy Economics	Machine Intelligence	Data Visualization	**5**

Semester –I

Fundamentals of Electrical Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hrs / Week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hrs / Week	Continuous Assessment: 40 Marks	Practical: 01
	Term Work: 50 Marks	Total: 05

Course Pre-requisites:

1. Students should have basic knowledge of physics i.e. electrical energy and power, magnetism, electrostatics, magneticmaterials, magnetic fields, electromagnetic theory etc.
2. Students should have basic knowledge of mathematics i.e. trignometric functions, matrices, complex numbers,differentiation and integration, vectors etc.

Course objectives:

To introduce fundamental concepts of DC Circuit Analysis and Network Theorems, Magnetic circuit and Electromagnetic Induction,AC Fundamentals & Single-Phase AC Circuits, Three Phase AC Circuits, Transformer, Performance and testing of transformer.

Course Outcomes:

The students will be able to

1.	Evaluate D.C. circuits using network theorems.
2.	Understand the concepts related to magnetic circuit.
3.	Understand the concepts related to electromagnetic induction.
4.	Describe and estimate single-phase A.C. circuits.
5.	Analyze and evaluate three-phase A.C. circuits.
6	Understand electrical wiring and components along with concept of earthing.

Topics covered

UNIT - I	**DC Circuit Analysis and Network Theorems:** Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, KCL and KVL, Super node and Super mesh analysis, Star-delta transformation, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem. (Simple numerical problems).	**(08 Hrs)**
UNIT - II	**Magnetic circuit:** Flux, flux density, field strength, analogy between electric & magnetic circuits,Right hand thumb rule, magnetic leakage, B-H curve, Magnetic hysteresis, hysteresis and eddy current losses, mutual coupling, Series and parallel magnetic circuitand simple numericals.	**(08 Hrs)**
UNIT - III	**Electromagnetic Induction:** Faraday's Law of EMI, Statically and dynamically induced emf, Lenz's Law, Self-Inductance, Coefficient of Self-inductance (L), Mutual inductance, Coefficient of Mutual inductance (M), Sign and dot convention, self-induced EMF and mutually induced EMF, Coefficient of Coupling, Inductance, and Energy Stored in Magnetic Field. (Simple numerical problems).	**(08 Hrs)**
UNIT -IV	**AC Fundamentals &Single-Phase AC Circuits:** AC Fundamentals: average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series & parallel RLC circuit: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement.	**(08 Hrs)**
UNIT-V	**Three Phase AC Circuits:** Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations,3-ph balanced AC Circuits, three-phase power and its measurement (simple numerical problems).	**(08 Hrs)**

UNIT-VI	**Electrical Wiring and Components:** Basic layout of the distribution system, Types of Wiring System & Wiring Accessories, Types of lamps (Incandescent, Fluorescent, Sodium Vapour, LED), Necessity of earthing, Types of earthing, tariff –introduction and types.	**(08 Hrs)**

List of Practical's to be performed in the laboratory:	
1.	Plotting B-H characteristics for a material.
2.	Verification of Kirchhoff's Laws.
3.	Verification of Superposition Theorem.
4.	Verification of Thevenin's Theorem.
5.	Verification of Maximum Power Transfer Theorem.
6.	Identify performance of R-L series, R-C series, R-L-C series circuit.
7.	Identify performance-L-C parallel circuit.
8.	Verification of voltage and current relationships in star and delta connected 3-phase networks.
9.	Study of electricity bill
10.	Study of R-L-C series circuits for XL>XC, XL< XC & XL= XC
11.	Demonstration of measurement of electrical quantities in DC and AC systems
Note: The term work shall be the record of minimum eight experiments performed from the above list.	
Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.	
1. Demonstration of principle of electromagnetism & it's applications.	
2. Demonstration of conversion of energy	
3. Demonstration of phenomenon of electromagnetic induction.	
4. Demonstration of electromagnetism and its applications by using professional software tool.	
5. Home automation system using IoT	
6. Smart Energy meter using GSM	
7. Solar and Smart energy systems	
8. Automatic Solar Tracker	
9. Study and understand safety practices in electrical system	
10. Study and understand electrical earthing system	
11. Wireless Power transmission	
12. Study and understand electrical wiring	
13. Fire detection system	
14. Home automation system using IoT	
Reference Books:	
1.	Electrical Technology - Edward Huges (Pearson)
2.	Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3.	Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4.	Principles of Electronics-Dr. H. M. Rai (SatyaPrakashan)
5.	Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI)
6.	Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)
7.	Principles of Communication Engineering - Anokh Singh, A. K. Chhabra (S Chand)
8.	A Textbook of Electrical Technology Volume- I, -B.L.Theraja.S.Chand and Company Ltd., New Delhi
9.	A Textbook of Electrical Technology Volume- II, -B.L.Theraja.S.Chand and Company Ltd., New Delhi
10.	Basic Electrical Engineering-V.K.Mehta,Rohit Mehta,S.Chand and Company Pvt Ltd., New Delhi
Unit Tests:	
UnitTest-1	UNIT–I,UNIT–II, UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

Computer Architecture		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs / Week	End Semester Examination: 60 Marks	Credits : 04
Practical: 00 Hrs / Week	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
	Computer System, Applications of Computers and Computer operations.
Course Objectives:	
	To learn the basic structure and operations of a computer. Understand and memory and I/O organization of a typical computer system.
Course Outcomes: After learning this course students will be able to	
1	Explain the basic structure of Computer system and its operations
2	Describe the Computer organization and functionality of Central processing unit.
3	Describe the design approaches in Control unit of Computers
4	Explain the concept of Memory organization.
5	Explain the structure and functions of I/0 module and peripherals
6	Describe the performance enhancement of processors.

UNIT – I	**Basic Structure of Computer System**	**(08 Hrs)**
	Computational model, Evolution of computer architecture, Functional Units- Basic Operational Concepts, Performance, Instructions: Language of the Computer, Operations, MIPS Addressing, development of modern computers, hardware and software performance, importance of computing power.	
UNIT - II	**CENTRAL PROCESSING UNIT:**	**(08 Hrs)**
	Introduction to x86 microprocessor, Architecture, register organization, Segmentation, Instruction execution cycle, addressing modes, and Instruction set, Instruction formats, Instruction Types, and Instruction Pipelining, RISC VS CISC Architecture.	
UNIT -III	**CONTROL UNIT**	**(08 Hrs)**
	Instruction cycle and Micro Operations, Functional Requirements, and operation of the Control Unit, Control signals, Single Bus Processor organization, Control Unit Design Methods, Control Memory, Microinstruction sequencing, Sequencing Techniques, Microinstruction execution, Microinstruction encoding.	
UNIT -IV	**MEMORY SYSTEM:**	**(08 Hrs)**
	Characteristics of Memory system, Internal and External Memory, Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage.	
UNIT - V	**I/O Interface**	**(08 Hrs)**
	Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Asynchronous Data Transfer, Handshaking, Modes of Transfer- Programmed I/O, Interrupt Initiated I/O, Direct Memory Access, Buses-SSCSI, USB	
UNIT -VI	**Performance enhancement of Processors**	**(08 Hrs)**
	CPU performance and its factors, Evaluating and Enhancement of Performance, Instruction Pipelining, Pipeline stages, Parallel processing concepts- Flynn's classification. Concurrent access to memory and cache memory.	

Term Work:
The term work shall consist of record of minimum eight experiments.
1. Study of peripherals, components of a Computer System
2. Study of Binary and Decimal Inter-Conversion system.
3. Study of Binary Addition
4. Study of Binary Subtraction.
5. Study Booth's Multiplication algorithm
6. Study of Restoring Division
7. Study of Non Restoring Division Algorithm
8. Study of Logisim Tool.
9. Realization of the basic logic and universal gates
10. Virtual Memory and replacement algorithms
11. Calculating throughput and speed in pipelining.
Text Books:
1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier.
2. William Stallings, "Computer Organization and architecture: designing for performance" Person Education India
3. Carl Hamacher, ZvonkoVrasenic and SafwatZaky, " Computer Organization", McGraw Hill.
Project Based Learning:
1. Development of Phone Book Application in C
2.Development of Temperature Conversion Table
3.Study of Mother Board components.
4.C- Programming experiments
5.Write a C program to add, subtract multiply and divide two non-zero numbers.
6.Write a C program to print all odd numbers from 1 to 100 using for loop and even numbers using while loop.
7.Write a C program to create a menu of math operations using switch case and do-while loop. The program should input 1-2, numbers and give options like square, cube, exponent (x^y or y^x), multiply , divide . ensure non zero numbers.
8.Write a C program to copy all numbers in an array to another array in reverse order and display the result.
9.Write a C program to find the factorial of a given number using recursive function.
10.Write a C program to reverse the string(in the same space) and print the resultant string. Make use of pointers.
11.Customer billing system.
12. Bus/ Airplane seat reservation system.
Reference Books:
1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
4. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
Unit Tests:

Unit Test-1	UNIT–I, UNIT–II, UNIT-III
Unit Test-2	UNIT–IV, UNIT–V, UNIT-VI

Solid State Devices & Electronic Circuits		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 50 Marks	Total: 05

Course Pre-requisites:

The Students should have knowledge of

1.	Fundamentals of Electrical Engineering
2.	Fundamentals of Semiconductor Physics.

Course Objectives:

1. To study different solid state electronics devices and various electronic systems using these devices and understand the principle of electronic circuits.

Course Outcomes: After learning this course students will be able to

1	Review of basic semiconductor devices I.
2	Review of basic semiconductor devices II.
3	Illustrate active and passive filters.
4	Explaining about amplifies and oscillators.
5	Outlining operational amplifiers.
6	Illustrating specialized IC applications.

UNIT – I	**Semiconductor Devices-I**	**(08 Hrs)**
	Rectifier diode, Zener diode, SCR, their symbol, construction, principle of operation characteristics, specifications, BJT- construction and working, CE, CB, CC configurations, BJT biasing, BJT frequency response.	
UNIT - II	**Semiconductor Devices-II**	**(08 Hrs)**
	Construction, principal of operation, characteristics, specificationsof Photodiode, LED, Solar Cells, Optoelectronic devices,MOSFET biasing, FET, JFET-biasing, characteristics and applications, Basics of NMOS,PMOS, CMOS. MOSFET frequency response	
UNIT -III	**Active & Passive Filters**	**(08 Hrs)**
	Working of C, L, PI filters, Types of filters: low pass filter, high pass filter, band pass filter, band stop filter, band reject filter, all pass filter. Difference between active and passive filters.	
UNIT -IV	**Amplifiers and Oscillators**	**(08 Hrs)**
	Single stage transistor amplifier-load line analysis, voltage gain, amplifier equivalent circuit, Multistage amplifier,Sinusoidal Oscillators- LC tank circuit, several of types and circuits of Oscillators such as, Hartely oscillator. Phase shift oscillator-Wien bridge oscillator.	
UNIT - V	**Operational Amplifier**	**(08 Hrs)**
	The ideal Op-amp, equivalent circuit of Op-amp, open loop Op-amp amplifier configurations-differential, inverting, non-inverting amplifiers. Feedback configurations-voltage series feedback amplifier, voltage shunt feedback amplifier, Op-amp as a summing, scaling and averagingamplifier, op-amp as differentiator and integrator.	

UNIT -VI	Specialized IC Application	(08 Hrs)
	The 555 timer as monostable, astable multivibrartor, and phase locked loops operating principle, 565 PLL and its applications,Voltage regulators –fixed, adjustable, switching and commonly ICs used in each type.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Study of JFET drain and transfer characteristics.
2. JFET biasing arrangement Graphical method
3. Find performance parameters for JFET amplifier - A_V, R_i, R_O
4. Simulation of JFET CS amplifier using multisim/spice.
5. Find performance parameters for JFET amplifier - A_V, R_i, R_O and compare with theoretical and practical results.
6. Input and Output Characteristics of BJT CE configuration.
7. Build and Test BJT in CE amplifier and find performance parameters - A_V, R_i, R_O,A_I
8. Simulation of BJT CE amplifier using multisim/spice
9. Study of MOSFET drain and transfer characteristics
10. Voltage follower by Op-amp.
11. Averaging by Op-amp.
12. Scaling amplifier by Op-amp.
13. Summing amplifier by Op-amp.
14. Difference amplifier by Op-amp.
15. Study of any five ICs studied in the subject – relevant diagrams, costing, various configurations, manufacturers, main specifications and introduction of their data sheet.
16. Self-arranged industrial visit to any electronics industry and report writing on same.
17. Attending seminar session / IEEE conference session/ local conference session/webinar/ talks by any electronics related expert and writing report on same

Project Based Learning(to be done in physical mode or circuit simulation software based):

1. Simple LED blinking block.
2. Simulation of logic gates.
3. Study of automatic light control.
4. Design of half wave rectifier (simulation or hardware).
5. Regulated power supply.
6. Circuitdesigning, simulation and electrical parameter measurement.
7. Application of transistor as a switch.
8. Study of JFET characteristics using software simulation.
9. Application of MOSFET as switch.
10. Application of Op-amp as non-inverting amplifier
11. Design of Scaling amplifier.
12. Design of Averagingamplifier.
13. Design of Op-amp as adder.
14. Design of Op-amp as subtractor.
15. Design of Op-amp as difference amplifier.

Text Books:

1. Neamen- Semiconductor Physics and DevicesTMH
2. Bhattacharya & Sharma- Solid State Electronic Devices-Oxford
3. Maini & Agrawal- Electronics Devices and Circuits-Wiley
4. Principles of Electronics- V.K.Mehta. S. Chand & Company Limited.

5. OP-Amps & Linear Integrated Circuts- Ramakant A. Gayakwad 6. Opearational amplifiers by D.Roychaudhari	
Reference Books:	
1. Milman, Halkias& Jit- Electronics Devices and Circuits-TMH	
2. Bell-Electronics Devices and Circuits-Oxford	
3. Singh &Singh-Electronics Devices and Integrated Circuits–PHI	
4. Bogart, Bisley& Rice-Electronics Devices and Circuits-Pearson	
5. Kasap-Principles of Electronic Materials and Devices-TMH	
6. Boylestad & Nashelsky- Electronics Devices and Circuit Theory-Pearson	
7. Salivahanan, Kumar & Vallavaraj- Electronics Devices and Circuits-TMH	
Unit Tests:	
UnitTest-1	UNIT–I,UNIT–II, UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

Skill based course - I Computer Programming - I		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Practical:04 Hrs/Week	TW: 25Marks & Oral: 25Marks	Practical :-02

Course Pre-requisites:

The Students should have knowledge of

1.	C Programming

Course Objectives:

	This course introduces knowledge about language C++ and various parameters associated with programming with C++. The object oriented programming with C++ plays important role in creating platform for other advanced programming languages. This course is considered as strong foundation for software related advancements.

Course Outcomes: Students will be able to

1.	Define and describe the basic terms and ideas about object oriented approach along with important paradigms.
2.	Illustrate the function of various classes and objects under object oriented approach with C++
3.	Analyze the significance of inheritance and its application.
4	Describe polymorphism along with hierarchies, categorization, methods of polymorphism.
5	Describe various files and examine them under object oriented approach followed by exception handling.
6	Explore concept of pointer, arrays and their significance in C++ programming.

UNIT-I	**Introduction to Object Oriented Programming:**
	Introduction to Object Oriented Approach, Overview of other paradigms {Functional, Data decomposition}, Basic terms and ideas about Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++, cin, cout, new, delete, operators.
UNIT-II	**Classes and Objects:**
	Encapsulation, Information hiding, Abstract data types, Object & classes, Attributes, Methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, Instantiation of objects, Default parameter value, Object types, C++ garbage collection, Dynamic memory allocation, Meta class / abstract classes.
UNIT-III	**Inheritance:**
	Inheritance, Defining derived classes & Visibility modes, Single, Multilevel, Multiple, Hierarchical and Hybrid inheritance, Virtual base classes & Abstract classes- , Constructors in derived classes, Nesting of classes.
UNIT-IV	**Polymorphism:**
	Composition Vs. Classification, Hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric Polymorphism.
UNIT-V	**Files and Exception Handling in C++ programming:**
	Object oriented Language, Application of OOP, Introduction to C++, Application of C++, Program Features, Comments, Output Operators, Iostream File, Namespace, Return Type of main (), Exception handling, Generic Classes, Throwing an exception, catching an exception: The try block, Exception handlers, Termination vs. Resumption, Exception specification, rethrowing an exception, uncaught exceptions, Standard exceptions, Programming with exceptions.
UNIT-VI	**Pointers:**
	Introduction to Pointer, Declaration and Initialization of Pointer; Dynamic memory allocation/deallocation operators: new, delete; Pointers and Arrays: Array of Pointers, Pointer to an array (1 dimensional array), Function returning a pointer, Reference variables and use of alias; Function call by reference. Pointer to structure: De-reference/Deference operator: *, ->; self referential structure.

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsfrombelowlist.

1. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
2. Write a C++ program to declare Struct. Initialize and display contents of member variables.
3. Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.
4. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
5. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).
6. Write a C++ to illustrate the concepts of console I/O operations.
7. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
8. Write a C++ program to allocate memory using new operator.
9. Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)
10. Write a C++ program to create an array of pointers. Invoke functions using array objects.
11. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.

Assignments:

1. Phone book
2. Temperature conversion table
3. Calculator
4. Games (Snake etc.)
5. Student data
6. Student report card system
7. Calendar
8. Personal Diary Management System
9. Bus reservation system
10. Library management system
11. Face detection using C++
12. Digital clock in C++
13. Attendance management system
14. Students' attendance system
15. Biometric system

TextBooks:

1. E. Balagurusamy – Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill , 2011.

2. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, First Edition, Pearson India

ReferenceBooks:

1. Robert Lafore, Object Oriented Programming in Turbo C++, First Edition, Galgotia Publications.

2. D Ravichandran, Programming with C++, Second edition, Tata McGraw- Hil

3. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education. C++ Programming Lab Manual / II-I SEM / 2019-20 Page 9

4. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press.

Semester –II

Java Programming		
TEACHINGS CHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory:04 Hrs/Week	End Semester Examination:60Marks	Theory:04
Practical:02 Hrs/Week	Continuous Assessment:40 Marks	Practical:01
	TW: 25 Marks	Total:05

Course Pre-requisites:

1. Students are expected to have a good understanding of basic computer principles.
2. Students should have basic knowledge of basics of computer programming languages.

Course objectives:

To understand Java programming, implement few applications related to Java Basics

Course Outcomes:

The students will be able to

1.	Explain concepts of Java
2.	Describe Data types, variables and methods in Java
3.	Identify constructors in Java
4.	Identify different Final keywords in Java
5.	Describe different Super keywords in Java
6.	Explain OOPS related to Java

Topics covered

UNIT- I	**Basics of Java** What is Java? History and Features of Java C++ vs. Java, Hello Java Program, Internal How to set the path?, JDK, JRE, and JVM (Java Virtual Machine), JVM Memory Management, Internal Details of JVM, Unicode System, Operators, Keywords, and Control Statements like if-else, switch, for loop, and while loop. **Class, Objects, and Types of Classes** Naming conventions of Java, Classes, objects, and features, Object declaration and initialization, The life cycle of an object, Anonymous object in Java. **Packages in Java** How to declare a package in a company project, Package naming conventions, Sub packages, Types of packages such as user-defined packages, built-in packages, Importing packages in Java.	**(08 Hrs)**
UNIT-II	**Data Types in Java** Data types in Java, Primitive data types, Non-primitive data types, Memory allocation of primitive and non-primitive data types. **Variables, Constraints, and Literals** Variable declaration and initialization, Naming convention, Types of variables such as local variables, instance variables, and static variables, Scope and memory allocation of variables. **Methods in Java** Use of method in Java, Method declaration, the method signature, Types of methods in Java: predefined method, user-defined methods: instance method, static method, Calling of method, Java main method, Return type in Java.	**(08 Hrs)**

UNIT-III	**Constructor in Java** What is Constructor in Java?, Types of Constructors: Default and parameterized constructors, Java constructor overloading, Constructor chaining in java, Copy constructor in Java, Modifiers in Java, What are an Access modifier ad a non-access modifier in Java? Types of access modifiers like private, default, protected, and public, Types of non-access modifiers like abstract, final, native, static, strictfp, synchronized modifier, transient, and volatile, Static Keyword, What is Static Keyword, Static variable, Static method, Static block, instance block, Static Nested Class in Java, Difference between static variable and instance variable, static method, an instance method, static block, and instance block	**(08 Hrs)**
UNIT-IV	**Final Keyword** Final Keyword, Final variable, Final method, Final class, Inner Class in Java, What is Inner Class in Java?, Types of Inner class in Java	**(08 Hrs)**
UNIT-V	**Super and this keyword** Super Keyword, Calling of superclass instance variable, Superclass, constructor, Superclass method **Encapsulation** Encapsulation in Java, How to achieve encapsulation, Data Hiding, Tightly encapsulated class, Getter and setter method in Java, Naming, convention of getter and setter method	**(08 Hrs)**
UNIT-VI	**Inheritance** Inheritance in Java, Is-A-Relationship, Aggregation and Composition, Types of Inheritance **Polymorphism** Polymorphism in Java, Types of Polymorphism, Static and Dynamic Binding, Method overloading, Method Overriding **Abstraction** Abstraction in Java, Abstract Class, Abstract method, Interface in Java, Nested interface, rules, and example programs	**(08 Hrs)**

List of Practical's to be performed in the laboratory:

1.	Program that demonstrates Generic Classes and methods
2.	Java program that Java EE Programming
3.	Java programming for file handling with JDBC connectivity
4.	Java application program for Spring boot
5.	Java application program for Spring framework
6.	Java Applet programming
7.	Java application program for RESTful Webservices
8.	Java application program for JSP Standard Tag Library (JSTL) and JSTL Tags.

Note: The term work shall be the record of minimum eight experiments performed from the above list.

Project based learning: Student shall demonstrate minimum one concept base do on syllabus topic.

1. Java Fundamentals
2. OOPs Concepts
3. Overloading & Overriding
4. Inheritance with Interface and Abstract Class
5. Exception Handling
6. Packages
7. Collections
8. Multithreading

Note: The term work shall be the record of minimum eight experiments performed from the above list.

Reference Books:

1.	Complete Reference schildt,Herbert Mcgraw Hill Education,New Delhi,ISBN:9789339212094
2.	JAVA 2 Programming Black Book , Holzner,Steven et al. ,Dreamtech Press ,New Delhi ISBN 10:817722655X/ISBN 13:9788177226553
3.	Java Server Programming Tutorial JAVA EE6 Black book ,kogent learning solutions, Dreamtech Press, new

	delhi,ISBN:978-81-77222-937-0
4.	Balaguruswamy, E. (2014). Programming with JAVA: A Primer. 5th edition. India: McGraw Hill
5.	Education 2. Horstmann, C. S. (2017). Core Java - Vol. I – Fundamentals (Vol. 10). Pearson Education
6.	Spring Boot in Action 1st Edition by Craig Walls (Author)
7.	**SOFTWARE/LEARNING WEBSITES** a) https://www.tutorialspoint.com/java b) http://nptel.ac.in/courses/106105084/30 c) https://www.javatpoint.com/servlet-tutorial d) https://www.tutorialspoint.com/servlets e) https://www.javatpoint.com/free-java-projects f) http://1000projects.org/java-projects.html

Unit Test:	
Unit Test-1	UNIT –I, UNIT– II, UNIT-III
Unit Test-2	UNIT –IV, UNIT–V, UNIT-VI

Classic Data Structures		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	Theory : 03
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25Marks	Total: 04

Course Pre-requisites:	
The Students should have knowledge of	
1.	Fundamentals of Computer Programming.
2	Knowledge of C & C++ Programming.

Course Objectives:	
	The course focuses on enabling students to understand how data is stored in computer programs using data structures and facilitate them to use and build fundamental data structures.

Course Outcomes:	**After learning this course students will be able to**
1	Compare and contrast the interfaces and internal representation of several linear abstract data types.
2	Solve given problems using array.
3	Implement Stacks in a high-level programming language.
4	Explain and Implement Queues in a high-level programming language.
5	Describe and Implement lists in a high-level programming language.
6	Demonstrate the ability to analyse, design, apply and use data structures and algorithms to solve engineering problems.

UNIT – I	**Introduction to Data structures & Arrays**	**(06Hrs)**
	Need of Data structure, Classification of Data Structures, Static Data Organization, Operations on Data Structures, Abstract data Types (ADT). Arrays: Introduction, Array Operations, representation of Arrays in Memory, Array with Functions, One- & Two-dimensional array in function, Implementation of One- & Two-Dimensional Arrays in Memory. Applications: string handling, polynomial equation solving, sparse matrix multiplication, tic-tac-toe, and data visualization	
UNIT - II	**Stacks**	**(06 Hrs)**
	Stack Definition and Structure, Operations on Stacks – create stack, Push stack, Pop stack, Stack top, Empty Stack, stack count, Destroy Stack, Array and Linked Representation, Types of Notations – Prefix, Infix and Postfix, Applications of Stack: Reversing Data, Converts Decimal to Binary, Parsing, Postponement, expression Conversion, and evaluation.	
UNIT -III	**Queue**	**(06 Hrs)**
	Queue: Introduction, Definition, ADT for queue, Storage Methods, Queue Operations, Enqueue, Dequeue, Queue front, Queue rear, Queue Example, Create Queue, priority Queue, Circular Queue. Application of Queue: Categorising Data, Queue Simulation.	
UNIT -IV	**Linear Lists**	**(06 Hrs)**
	Introduction, singly linked list, Circularly Linked List, Doubly Linked lists, Basic operations, - Insertion, Deletion, retrieval, traversal, create List, insert node, delete node, List Search, Empty list, Destroy list.	
UNIT -V	**Linked Stacks and Linked Queues**	**(06Hrs)**

	Introduction, Operations on Linked stacks and Linked Queues, Dynamic Memory management and Linked Stacks, Implementation of Linked Representations.	
UNIT -VI	**Overview of Real time Applications of Linear Data Structures**	**(06 Hrs)**
	Stacks – Balancing of Symbols, Infix to Postfix, Evaluation of Postfix expression, Implementing Function Calls, Finding of Spans, undo sequence in text editor, Matching Tags in HTML and XML. Linked List – Implement Stack using Linked List. Queues – Scheduling Jobs, Simulation of real-world queues such as ticket counter or first come first served scenarios, Asynchronous Data Transfer.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Study assignment on programming IDE Tools
2. Write a program to implement one dimensional array
3. Write a program to design tic-tac-toe game
4 Write a program to perform basic operation on stack
8 Write a program to convert and evaluate polish notations.
9 Write a program to perform basic operation on stack.
10 Write a program to implement Priority queue & Double Ended Queue.
8. Write a program to perform basic operation on circular queue.
9. Write a program to implement hashing technique.
10 Write a program to implement searching and sorting techniques

Project Based Learning:

1. Expression Evaluation
2. Traffic Management System
3. Library Management System
4. Employee Record System
5. Dictionary
6. Calendar Application
7. Medical Store Management System
8. Cricket Score Sheet

Text Books:

1. Brassard & Bratley, ―Fundamentals of Algorithmic‖, Prentice Hall India/Pearson Education, ISBN 13-9788120311312.
2. Horowitz and Sahani, ―Fundamentals of Data Structures in C++‖, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
3. Goodrich, Tamassia, Goldwasser, ―Data Structures and Algorithms in C++‖, Wiley publication, ISBN-978-81-265-1260-7
4. Data Structure and Algorithmic Thinking with Python, CareerMonk Publications, NarasimhaKarumanchi, 2016

Reference Books:

1. Richard F Gilberg& Behrouz A Forouzan, Data Structures (A Pseudocode Approach with C), second edition, Cengage Learning, 2004.
2. PAI, Data Structures, Tata McGraw-Hill Education, 2008
3. Mayank Patel, Data Structure and Algorithm With C, Edu creation Publishing, 2018
4. Thomas H. Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2001.

Unit Tests:

UnitTest-1	UNIT–I,UNIT–II, UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

Instrumentation & Measurements

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs/Week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 50 Marks	Total: 05

Course Pre-requisites:

The Student should have knowledge of

1.	Basic electrical Engineering Parameters such as Voltage, Current, Power, Energy, etc.

Course Objectives:

	This course introduces knowledge about electrical measurements and instrumentation. The course is designed to learn different methods of measurements of various electrical parameters and also to learn the different physical parameters with the help of the various measurement and instrumentation techniques.

Course Outcomes: After learning this course students will be able to

1	Explain the importance of measurement and able to find the resistance, inductance and capacitance using various methods.
2	Explain the construction, working principle of wattmeter and Energy meter and apply the knowledge to measure the power and energy.
3	Describe block diagram, state specifications, functions of various digital/automated meters, harmonic analyzer. Observe the waveforms and measure the voltage, current, phase and frequency on CRO and to use DSO.
4	Define, classify transducers and measure the displacement, level using various methods.
5	Define, classify transducers and measure the flow and pressure using various methods.
6	Define, classify transducers and measure the temperature and velocity using various methods.

UNIT – I	**Measurement of circuit parameters**	**(08 Hrs)**
	Introduction: Classification of measuring instruments, Error in measurements, sources of error. **Measurement of Resistance (No derivation)**– Classification of resistances,Ammeter-voltmeter method, Wheatstone bridge. Megger. Measurement of earth resistance – Fall of potential method, earth tester. **Measurement of Inductance and Capacitance (No derivation)** Measurement of Inductance: Maxwell's Inductance, Anderson's Bridge. Measurement of Capacitance- Schering Bridge.	
UNIT - II	**Measurement of Power and Energy**	**(08 Hrs)**
	Measurement of Power(No derivation): Construction, working principle, advantages/disadvantages, errors and their compensation of dynamometer type wattmeter, low power factor wattmeter, Active & reactive power measurement in three phase balanced & unbalanced system (one wattmeter and two wattmeter methods), Three Phase wattmeter. **Measurement of energy (No derivation):** Construction, working principle, advantages/disadvantages of Energy Meters in AC circuits, Single Phase Induction Type Energy Meter - Construction, principle of operation, torque equation of induction type energy meter, errors and adjustments. Electronic energy meter	
UNIT - III	**Electronic Devices and Signal Analyzer's**	**(08 Hrs)**
	Concept of: Numeric meter & its types (TOD, ABT, Prepaid & panel mounted meters. Measurement of power & energy by sampling technique automatic meter reading (AMR) and advanced metering infrastructure (AMI), Meter reading instrument (MRI).	

	Wave Analyzers – Frequency Selective Wave Analyzers and its applications. Harmonic Distortion Analyzer, Spectrum Analyzer, Power Analyzer. CRO and Digital Storage Oscilloscope – Principle of operation and waveform reconstruction.	
UNIT - IV	**Displacement and Level Measurement**	**(08 Hrs)**
	Introduction to Transducers, classification, basic requirements for transducers and Advantages of Electrical Transducers. **Displacement measurement(No derivation):** Potentiometer as displacement transducer**,** Strain Gauge: construction, working, advantages and disadvantages, LVDT &RVDT – construction, working, application, Capacitive transducers – Advantages, Disadvantages and Applications. **Level measurement(No derivation):** Introduction and importance of level measurement, level measurement methods: Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors	
UNIT - V	**Flow andPressure Measurement**	**(08 Hrs)**
	Flow Measurement (No derivation)– Rate of flow**,** Turbine Meter, Electromagnetic Flow Meters, Hot Wire Anemometer, Ultrasonic Flow Meter. **Pressure Measurement(No derivation):** Introduction, Types of Pressure Measurements Devices, Pressure Measurement using Electrical Transducers as Secondary Transducers.– Thermocouple Vacuum Gauge, Pirani Gauges and Ionization Type Vacuum.	
UNIT - VI	**Temperature and Velocity Measurement**	**(08 Hrs)**
	Temperature Measurement(No derivation): Electrical Resistance Thermometer, Thermocouples, Thermistors. **Velocity Measurement (No derivation)**– Measurement of Linear Velocity: Electromagnetic transducers, Moving Magnet Type, Moving Coil Type, Measurement of Angular Velocity: Electrical Tachometers, Photoelectric Tachometer.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Measurement of resistance by Kelvin double bridge/ Wheatstone bridge/Ammeter-voltmeter method
2. Measurement of capacitance and loss angle by Schering Bridge.
3. Measurement of inductance by Anderson's bridge/ Maxwell's Inductance Bridge.
4. Measurement of resistance, capacitance and inductance using LCR meter.
5. To measure power in three phases balanced load by one wattmeter method.
6. To measure power in three phase balanced/ unbalanced load by two wattmeter method.
7. To measure reactive power in three phase circuit by one wattmeter method.
8. To calibrate single phase energy meter at (i) unity power factor (ii) 0.5 lagging power factor (iii) 0.5 leading power factor (analog /Digital)
9. Measurement of Voltage, current and resistance using digital voltmeter and digital multimeter.
10. To study and analyze the various electrical parameters using Power Analyzer.
11. To study the observation of waveforms on CRO, measurements of voltage and current, measurement of phase and frequency using CRO / digital storage oscilloscope
12. Displacement measurement using LVDT.
13. Strain measurement using strain gauge.
14. Study of process control application of using the instrumentation kit.
15. Measurement of Pressure using Bellows, Bourdon gauge, Diaphragm.
16. Calibration of vacuum gauge using vacuum gauge tester.
17. Characterization of RTD (PT100)

Project Based learning topics

1. Measurement of voltage and current using instrument transformers
2. Calibration of voltmeter, ammeter, wattmeter (Using power analyser)

3. Measurement of earth resistance
4. Measurement of insulation resistance.
5. Design / development / simulation of measurement of any physical parameter using transducer/s.
6. Demonstration of 7 segment LED for measurement
7. Selection of digital instrument for specific application using user manual / data sheet

Text Books:

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhney, Dhanpat Rai & Sons.
2. Electronic Instrumentation: H.S. Kalsi – THM, 2nd Edition 2004.
3. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.

Reference Books:

1. Electrical Measurement & Measuring Instruments Fifth edition, by E. W. Golding & Widdies, A. H. Wheeler & Co. Ltd.
2. Electronic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.
3. Introduction to Measurements and Instrumentation, Second Edition by Ghosh, PHI Publication.
4. Introduction to Measurements and Instrumentation by Anand. PHI Publication

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Skill base course – II Computer Programming -II		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:00 Hrs/Week	EndSemesterExamination:00Marks	Theory:00
Practical:04 Hrs/Week	ContinuousAssessment:00 Marks	Practical:02
	TW:25 Marks Oral:25Marks	Total:02

Course Pre-requisites:

Students are expected to have a good understanding of basic computer principles.
Students should have basic knowledge of computer programming languages.

Course objectives:

1. To learn basics, features and future of Python programming.
2. To understand data types, input output statements, decision making, looping and functions in Python
3. To learn features of Object Oriented Programming using Python
4. To understand the use and benefits of files handling in Python

Course Outcomes:

The students will be able to

1.	Describe the scope and usage of Python language
2.	Extract the basics of Python
3.	Explain the Control Statements and Program flows
4.	Describe the Functions and Models
5.	Explain File Handling and Dictionaries
6.	Identify the Object oriented programming approach using Python

UNIT- I	**Introduction to Python:** What can python do? Why Python?,Procedure oriented and object oriented approach of python programming, pyhon Syntax compared to other programming languages, python IDE, Installation of Anaconda IDE(online Jupyter Colab), Using the Python interpreter, Features of Python, History and Future of Python, Writing and executing Python program
UNIT-II	**Beginning Python Basics** The Print statements and its different types, simple input output statement, Literal constants, variables and identifiers, Data Types, Comments, Reserved words, Indentation, Python Operators and expressions, Expressions in Python, Python Data Structures and DataTypes-list,Tuples,Strings,Dictionary. List- creating, assessing, adding and updating values. Tuples- creating, assessing, adding and updating values. Strings- creating, assessing, adding and updating values. Dictionaries- creating, assessing, adding and updating values.
UNIT-III	**Decision Control Statements /Program Flows** Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, The break, continue, pass, else statement used with loops, Range statement and its forms.
UNIT-IV	**Functions and Modules** **Function**: definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. **Introduction to modules:** Introduction to packages in Python, Introduction to standard library modules.
UNIT-V	**File Handling and Dictionaries** Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files, Appending Files, Handling File Exceptions, The with Statements.

UNIT-VI	**Object Oriented Programming Approach Using Python** Programming Paradigms- procedural programming language, structured and object oriented, **Features of Object oriented programming**-classes, objects, methods and message passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation. **Classes and Objects**: classes and objects, class method and self object, class variables and object variables, public and private members, class methods.
List of Practical's to be performed in the laboratory:	
1.	To simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing xy and x!.
2.	To accept student's five courses marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and = and = and
3.	To generate pseudo random numbers
4.	To accept list of N integers and partition list into two sub lists even and odd numbers
5.	Python program to swap two variables
6.	Python Program to Check if a Number is Positive, Negative or Zero
7.	Python Program to Print all Prime Numbers in an Interval and Find the Factorial of a Number using functions
8.	Python Program to Display the multiplication Table
9.	Python Program to Find the Sum of Natural Numbers
10.	To count total characters in file, total words in file, total lines in file and frequency of given word in file.
11.	Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a)total number of employees in an organization b) count of male and female employee c) Employee with salary more than x) Employee with designation "Asst Manager"
12.	Write a python program that accepts a string from user and perform following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring
13.	Python Program to Add Two Matrices, Multiply Two Matrices, Transpose a Matrix
14.	Python List data Structure Programs Python Program to append element in the list Python Program to compare two lists Python Program to convert list to dictionary Python Program to remove an element from a list Python Program to add two lists Python Program to convert List to Set Python Program to convert list to string
15.	Python Dictionary Data Structure Programs Python Program to create a dictionary Python Program to convert list to dictionary Python Program to sort a dictionary Python Program to Merge two Dictionaries
Note: The term work shall be the record of minimum eight experiments performed from the above list.	
Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.	
Note: The term work shall be the record of minimum eight experiments performed from the above list.	
ReferenceBooks:	
1.	Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
2.	R. Nageswara Rao, "Core Python Programming", Dreamtech Press; Second edition ISBN10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL
3.	Jeeva Jose, P. Sojan Lal, "Introduction to Computing & Problem Solving with Python", Khanna Computer

	Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978- 9382609810.
4.	Romano Fabrizio, “Learning Python”, Packt Publishing Limited, ISBN: 9781783551712, 1783551712
5.	R. G. Dromey, “How to Solve it by Computer”, Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629 Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645
6.	Martin C. Brown, “Python: The Complete Reference”, McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943

Other Branches (CE, CSE, ECE, E&TC)

Electrical Technology		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs / Week	**End Semester Examination:** 60 Marks	**Theory:** 04
Practical: 02 Hrs / Week	**Continuous Assessment:** 40 Marks	**Practical:** 01
	TW: 25Marks	**Total:** 05

Course Pre-requisites:	
The students should have basic knowledge of	
1.	Mathematics, Physics and Chemistry.
Course Objectives:	
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer, electrical wiring, illumination and Tariff system.
Course Outcomes: After learning this course the students will be able to	
1.	Describe basic concepts of work, power, energy for energy conversion and calculate current in electrical network using Kirchoff's laws.
2.	Extract response of electrical DC circuit using network theorems.
3.	Define and understand basic terms of single phase A.C. circuit and supply systems.
4.	Define and understand basic terms of three phase A.C. circuit and measurement of three phase power.
5.	Describe and apply fundamental concepts of magnetic circuit and electro-mechanics for operation of single phase transformer.
6.	Explain layout of distribution system, illumination, types of wiring, earthing system and Tariff system.

UNIT - I	**Introduction**	**(08 Hrs)**
	Concept of EMF, Potential difference, voltage, current, resistance. Fundamental linear, passive and active elements, voltage sources and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Batteries: Principle, types, construction and working.	
UNIT - II	**DC Circuits**	**(08 Hrs)**
	Current-voltage relations of the electric network by mathematical equations to analyze the network (Superposition theorem, Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem), Simplifications of networks using series-parallel, Star/Delta transformation.	
UNIT - III	**Single phase AC Circuit**	**(08 Hrs)**
	Sinusoidal AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, resonance, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive and apparent power, power factor. (simple numerical problems).	
UNIT - IV	**Three phase AC circuit**	**(08 Hrs)**
	Three phase system-its necessity and advantages, meaning of phase sequence, line and phase voltage/current relations, star and delta connections, balanced supply and balanced load, three phase power and its measurement (simple numerical problems).	
UNIT - V	**Electro-Mechanics**	**(08 Hrs)**
	Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Magnetic circuit, Magnetic material and B-H Curve, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, efficiency and regulation, Determination of efficiency & regulation by direct load test.	
UNIT - VI	**Electrical Wiring and Components**	**(08 Hrs)**

	Basic layout of the distribution system, Types of wiring system & wiring accessories, Types of lamps (Incandescent, Fluorescent, Sodium Vapour, LED), Necessity of earthing, Types of earthing, Tariff –introduction and types.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Familiarization of electrical Elements, sources, measuring devices related to electrical circuits.
2. Study of residential electricity bill.
3. Verification of Superposition theorem
4. Verification of Thevenin's theorem
5. Verification of Norton's theorem
6. Verification of Kirchoff's laws
7. Verification of Maximum power transfer theorem
8. Study of R-L, R-C series and parallel circuit.
9. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
10. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
11. Demonstration of measurement of electrical quantities in DC and AC systems.
12. Determination of efficiency & regulation of single-phase transformer by direct load test.

Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.

1. Demonstration of conversion of energy.
2. Study and understand practical specifications of transformer.
3. Study and understand practical specifications of battery and demonstrate its application.
4. Demonstration of phenomenon of electromagnetic induction.
5. Demonstration of electromagnetism, electro mechanics and their applications by using professional software tool.
6. Development of practical kits for understanding different theorems related to electrical circuits. (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem, Superposition theorem etc.)
7. Demonstration of illumination system.
8. Demonstration of distribution system.
9. Study and understand safety practices in electrical system.
10. Study and understand electrical earthing & wiring system.

Text Books:

1. Electric Machinery,(Sixth Edition) A.E. Fitzgerald, KingselyJr Charles, D. Umans Stephen, Tata McGraw Hill.
2. A Textbook of Electrical Technology,(vol. I & II),B. L. Theraja, Chand and Company Ltd., New Delhi.
3. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (SecondEdition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press.
2. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3. Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book Company Inc.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.
5. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication
6. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications
7. John Omalley Shawn – "Basic circuits analysis" McGraw Hill Publications
8. Vincent Del Toro – "Principles of Electrical Engineering", PHI Publications

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Other Branches (Mechanical, Robotics & Automation)

Electrical Engineering Systems		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs / Week	**End Semester Examination:** 60 Marks	**Theory:** 04
Practical: 02 Hrs / Week	**Continuous Assessment:** 40 Marks	**Practical:** 01
	TW: 25Marks	**Total:** 05

Course Pre-requisites:	
The students should have basic knowledge of	
1.	Mathematics, Physics and Chemistry.
Course Objectives:	
	The course introduces fundamental concepts of DC and AC Circuits, Electrical Measurement, Transformers, Induction Machines, DC Machines, Basics of power transmission, distribution & safety measures.
Course Outcomes: After learning this course the students will be able to	
1.	Describe and solve Basic laws and network theorems to solve electrical networks
2.	Describe and solve AC Circuits, Switch gear and electrical measuring instruments
3.	Describe fundamental concept of magnetic and electromagnetic circuits for operation of Transformers
4.	Explain AC motors, it's control techniques for various mechanical engineering applications
5.	Explain DC motors, it's control techniques for various mechanical engineering applications
6.	Explain working of Transmission, Distribution of power use of safety rules.

UNIT - I	**DC Circuit Analysis and Network Theorems**	**(08 Hrs)**
	Circuit Concepts: Concepts of network, active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation, Kirchhoff's laws, loop and nodal methods of analysis, star-delta transformation. **Network Theorems:**Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems).	
UNIT - II	**AC Circuits and Switch Gear, Electrical Measurement**	**(08 Hrs)**
	AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation of AC quantities, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), series and parallel resonance. Three phase balanced circuits, voltage and current relations in star and delta connections. **Measuring Instruments:**Power measurement in three phase circuits. Electrical instruments such as wattmeter, energy meter, tong-tester, megger and power analyzer. **Switch Gear:**Introduction to LT Switchgear, NO and NC Contacts, Contactors, relay, timers, use in control panel, application in interlocking and protection, symbols.	
UNIT - III	**Magnetic Circuit and Electromagnetic Induction**	**(08 Hrs)**
	Magnetic Circuit:flux, flux density, field strength, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling. **Electromagnetic Induction:**Faradays law of EMI, induced emf, lenzs law, self inductance, coefficient of self inductance (L), mutual inductance, coefficient of mutual inductance (M), self	

	induced emf and mutually induced emf, coefficient of coupling, inductance in series, types of inductor, their application and energy stored in magnetic field **Transformers:**Single phase and Three phase: Working principle, Construction, Types, applications.	
UNIT - IV	**Induction Machines**	**(08 Hrs)**
	Three Phase Induction Motor: construction, types, rotating magnetic field, principle of operation, slip, frequency of rotor current, rotor emf, rotor current, expression for torque, conditions for maximum torque, torque slip characteristics, starting torque in squirrel cage and slip ring motors, effect of change in supply voltage on torque, slip and speed , relation between full load torque and maximum torque, power stages in induction motor, vector diagram and equivalent circuit, no load and block rotor test, speed control of 3 phase motor, starting methods for 3 phase induction motor, circle diagram, construction and calculation. **Single Phase Motor:** construction, double revolving field theory, starting methods & types of single-phase motor, equivalent circuit. **Servomotor:** construction, types, working, characteristics, application in automation and robotics.	
UNIT - V	**DC Machines**	**(08 Hrs)**
	DC Generator: construction, emf equation of dc generator, methods of excitation, losses, condition for maximum efficiency, armature reaction, interpoles and compensating winding, commutation, methods of improving commutation, characteristics of separately excited and self excited dc generator. **DC Motor:** Working principle, voltage equation, condition for maximum power, torque developed, operating characteristics of dc motor, starting: 3 point and 4 point starter, speed control methods, Swinburne's and brake test of dc shunt motor. Soft-starting of dc motors.	
UNIT - VI	**Basic of Power transmission and distribution, Safety Measures**	**(08 Hrs)**
	Basic of Power transmission and distribution:classification of transmission lines, transmission line parameters, ABCD constants, voltage regulation, ferranti effect, efficiency of transmission line. 3-phase 3-wire and 3-phase 4-wire distribution system, feeders, distributors, main lines, comparison of various distribution systems, load power factor improvement techniques. **Safety Measures: S**afety measures in electrical system, safety rules, basic principles of earthing-types of earthing.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Plotting B-H characteristics for a material
2. Verification of Kirchhoff‟s Laws
3. Verification of Superposition Theorem
4. Verification of Thevenin‟s Theorem
5. Verification of Maximum Power Transfer Theorem
6. Study of R-L series, R-C series, R-L-C series circuit
7. Time response of R-L series and R-C series circuit
8. Verification of voltage and current relationships in star and delta connected 3-phase networks
9. Single lamp controlled by two different switches (staircase)
10. Two lamps controlled independently from two different switches (parallel)
11. Series connected lamps
12. Study of Electricity bill(Industrial / commercial)
13. Direct loading tests on single phase transformer

14. Mini-project based on contents of syllabus.

Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.

1. To develop a practical kit for verification of Thevenin's theorem.
2. To develop apractical kit for verification of Superposition theorem.
3. To develop apractical kit for verification of Maximum power transfer theorem
4. To develop apractical kit for verification of Norton's theorem.
5. To develop a practical kit for study of R-L-C Series circuit.
6. To develop apractical kit for study of R-L-C parallel circuit.
7. To develop apractical kit for study of voltage and current relationships in starconnected network.
8. To develop apractical kit to understand voltage and current relationships in delta connected network.
9. To develop a demonstration model of single-phase transformer for practical application.
10. Case study on transformer operation and testing by using professional software.
11. To develop a demonstration model of Smart Energy meter using GSM
12. To develop a demonstration model of Safety measures in electrical system.
13. Case studies on – Learning industrial Safety through films/Videos
14. Case studies on – Learning industrial Safety through posters/charts

Assignments:

1. DC Circuit Analysis
2. Network Theorems
3. AC Circuits and Switch Gear
4. Electrical Measurement
5. Single Phase Transformer
6. Three Phase Transformer
7. 3 Phase induction motor
8. Single phase motor
9. DC Generator & Motor
10. Power transmission and distribution Safety Measures

Text Books:

1. Theory and problems of Basic Electrical Engineering, (SecondEdition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
2. Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book Company Inc.
3. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.
4. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication
5. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications
6. John Omalley Shawn – "Basic circuits analysis" McGraw Hill Publications
7. Vincent Del Toro – "Principles of Electrical Engineering", PHI Publications
8. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
9. Principles of Electronics-Dr. H. M. Rai (SatyaPrakashan)
10. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI