।। सा विद्या या विमुक्तये ।।
स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड
"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)
Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade
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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे **CBCS Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७–२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्यात येत आहेत.

1. B.Sc.-II Year-Biophysics	2. B.Sc.-II Year-Bioinformatics
3. B.Sc.-II Year-Biotechnology	4. B.Sc.-II Year-Biotechnology (Vocational)
5. B.Sc.-II Year-Food Science	6. B.Sc.-II Year-Botany
7. B.Sc.-II Year-Horticulture	8. B.Sc.-II Year-Agro Chemical Fertilizers
9. B.Sc.-II Year-Analytical Chemistry	10. B.Sc.-II Year-Biochemistry
11. B.Sc.-II Year-Chemistry	12. B.Sc.-II Year-Dyes & Drugs Chemistry
13. B.Sc.-II Year-Industrial Chemistry	14. B.C.A. (Bachelor of Computer Application)-II Year
15. B.I.T. (Bachelor of Information Technology)-II Year	16. B.Sc.-II Year-Computer Science
17. B.Sc.-II Year-Network Technology	18. B.Sc.-II Year-Computer Application (Optional)
19. B.Sc.-II Year-Computer Science (Optional)	20. B.Sc.-II Year-Information Technology (Optional)
21. B.Sc.-II Year-Software Engineering	22. B.Sc.-II Year-Dairy Science
23. B.Sc.-II Year-Electronics	24. B.Sc.-II Year-Environmental Science
25. B.Sc.-II Year-Fishery Science	26. B.Sc.-II Year-Geology
27. B.Sc.-II Year-Mathematics	28. B.Sc.-II Year-Microbiology
29. B.Sc.-II year Agricultural Microbiology	30. B.Sc.-II Year-Physics
31. B.Sc.-II Year Statistics	32. B.Sc.-II Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२०–२१/**३३३**

दिनांक : १५.०७.२०२०.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

CLASS: B. Sc. SECOND YEAR

Subject: Electronics - Semester III & IV

(W. e. f. June 2020)

Semester	Paper No	Name of Course	Instruction Hours/ Week	Total periods	CA	ESE	Total Marks	Credits
III	CCE-III (Section A)	Amplifiers (P-VI)	03	45	10	40	50	02
	CCE-III (Section B)	Microprocessor and Its Applications (P-VII)	03	45	10	40	50	02
	SEC-I	SEC-I(A): Electronics Lab Skills OR SEC-I(B): Renewable Energy & Energy Harvesting	03	45	25	25	50	02
IV	CCE-IV (Section A)	Oscillators and Multivibrators P- VIII	03	45	10	40	50	02
	CCE-IV (Section B)	Introduction to Microcontroller Intel 8051 P- IX	03	45	10	40	50	02
	SEC-II	SEC-II(A): Interfacing Chips OR SEC-II(B): Electrical Circuit Skills	03	45	25	25	50	02
III & IV	CCEP-II (Section A)	P-X (Practicals based on P-VI and P-VIII)	03	45	10	40	50	02
	CCEP- III (Section B)	P-XI (Practicals based on P-VII and P-IX)	03	45	10	40	50	02
Total credits								16

CCE : Core Course Electronics **CCEP :** Core Course Electronics Practical
SEC : Skill Enhancement Course **CA:** Continuous Assessment
ESE : End Semester Exam

Note : ESE for **CCEP-II, CCEP- III, SEC-I** and **SEC-II** should be conducted as Annual Examinations (Summer Exams).

CCE-IIIA (Paper-VI): Amplifiers

Credits : 02 **Periods : 45** **Max Marks: 50**

Course Pre-requisite: P-I: Basic Electronics & Network Analysis

Course Objectives:

1. To study transistor biasing.
2. To introduce h-parameters and circuit analysis.
3. To understand basics of Operational Amplifiers.

Course Outcome:

1. Knowledge of transistor biasing.
2. Analysis of small signal amplifier using h-parameters and designing of CE amplifier.
3. Concept of an ideal amplifier, knowledge of IC 741 and its applications.

Unit I: Transistor Biasing (12 periods)

DC load line, Q-point and maximum undistorted output, factors affecting bias variations, stability factor, stability factor for CB and CE circuits, base bias with emitter feedback, base bias with collector feedback, voltage divider bias. (Numerical Examples)

Unit II: Signal Amplifiers (11 periods)

h-parameters, an equivalent circuit for BJT transconductance model, analysis of CE-amplifier, CB-amplifier, and CC-amplifier using h-parameters. (Numerical Examples)

Unit III: Operational Amplifier (11 periods)

Theory of differential amplifier, CMRR, constant current replacement for R_E, block diagram of Op-Amp, characteristics of an ideal Op-Amp, concept of virtual ground, input offset voltage, input offset current, input bias current, input and output impedances of Op-Amp, slew rate, Op-Amp inverting amplifier, Op-Amp non-inverting amplifier.
(Numerical Examples)

Unit IV: Applications of Op-Amp (11 periods)

Op-Amp as an adder, Op-Amp as subtractor, Op-Amp as differentiator, Op-Amp as an integrator, Op-Amp as comparator, Op-Amp as Schmitt's trigger, solving of differential equations using Op-Amp, voltage to current converter with floating load, current to voltage converter. (Numerical Examples)

Reference Books:

1. A Text-book of Applied Electronics by R. S. Sedha, Multicolour Edn-2018, S. Chand & Company New Delhi.
2. Basic Electronics Solid State by B. L. Theraja, Multicolour Edn- 2008, S. Chand & Company New Delhi.
3. Handbook of Electronics by Gupta, Kumar, 44thEdn, 2017, Pragati Prakashan, Meerut.
4. Principles of Electronics by V. K. Mehata, Rohit Mehata, 2013 Edn, S. Chand & Company New Delhi.
5. Electronic Fundamentals and Applications by John D. Ryder, Prentice Hall of India Pvt Ltd.
6. Op-Amp and Linear Integrated Circuits by Ramakant Gaikwad, Prentice Hall of India Pvt Ltd

CCE-IIIB (Paper-VII): Microprocessor and Its Applications

Credits : 02 **Periods : 45** **Max Marks: 50**

Course Pre-requisite: P-IV: Digital Logic Circuits

Course Objectives:

1. To introduce the concept of microcomputer and microprocessor as a CPU.
2. To introduce interfacing chips.
3. To study instruction set of 8085 and ALP .

Course Outcome:

1. Knowledge of microprocessor based systems.
2. Knowledge of Instruction set of 8085 and ALP skills.
3. Working and applications of ICs 74LS373 and Intel 8255.

Unit I: Architecture of 8085 Microprocessor (12 periods)

Block diagram of microprocessor based system, features of Intel 8085, block diagram of Intel 8085, function of each block, functional pin diagram of Intel 8085 and pin description, demultiplexing of AD_0–AD_7 bus using latch IC 74LS373.

Unit II: Instruction Set of 8085 (12 periods)

Instruction cycle, machine cycle, T state, instruction format (1, 2, 3 byte), addressing modes, classification of instructions, instruction set of 8085.

Unit III: Programming of 8085 (11 periods)

Simple Assembly Language Programs (addition, subtraction, 1's complement, 2's complement, smaller no. and larger no., sum of series, block transfer), delay, delay subroutine using one register and register pair.

Unit IV: IC 8255 and Its applications (10 periods)

Block diagram of IC 8255, Functional pin diagram of IC 8255, Operating modes of 8255, control word pattern of 8255 and its application for interfacing LED and switch.

Reference Books:

1. Fundamentals of Microprocessor and Microcomputers by B. Ram, 6th Edn, 5th Reprint, Dhanpat Rai Publications.
2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh Gaonkar, 5th Edn, Penram International Publishing (India) Pvt. Ltd.

3. 8-bit Microprocessor by V. J. Vibhute, P. B. Borole, U. S. Shah, 6th Revised ed., Tech-Max Publications.
4. 8085 Assembly Language Programming by Lance A. Leventhal, McGraw Hill International Edn.
5. Introduction to 8085, 8086 Microprocessors and peripherals – K M Bakwad, A K Deshmane, Nikita Publication, Latur.

CCE-IVA (Paper-VIII): Oscillators and Multivibrators

Credits : 02 **Periods : 45** **Max Marks: 50**

Course Pre-requisite: P-VI: Amplifiers

Course Objectives:

1. To study feedback principles and effect of feedback on amplifier performance.
2. To study sinusoidal oscillators.
3. To study multivibrators and IC 555.
4. To study time base circuits.

Course Outcome:

1. Understanding of positive and negative feedback.
2. Knowledge of working of an oscillator.
3. Working principle of multivibrators and applications of IC 555
4. Knowledge of various time base circuits.

Unit I: Feedback Principles (11 periods)

Concept of positive and negative feedback, advantages and disadvantages of negative feedback, gain stability, increased bandwidth, decreased distortion, decreased noise.

(Numerical Examples)

Unit II: Sinusoidal Oscillators (12 periods)

Requirements of an oscillator, Barkhausen criterion, Hartley oscillator, Colpitt's oscillator, R-C oscillators: phase-shift oscillator, Wien bridge oscillator, (circuit diagram, working condition for oscillations and expression for frequency for each oscillator),

(Numerical Examples)

Unit III: Multivibrators (11 periods)

Transistor as a switch, transistorised astable multivibrator, transistorised monostable multivibrator, transistorised bistable multivibrator, transistorised Schmitt's trigger, block diagram of IC 555, IC 555 as monostable multivibrator. (Numerical Examples)

Unit IV: Time Base Circuits (11 periods)

Introduction, types of time base circuits, methods of generating time base waveforms, exponential sweep circuit, sweep circuit using transistor switch, sweep circuit using UJT, transistor constant current sweep, Miller sweep circuit, bootstrap sweep circuit.

(Numerical Examples)

Reference Books:

1. A Text-book of Applied Electronics by R. S. Sedha, Multicolour Edn-2018, S. Chand & Company New Delhi.
2. Handbook of Electronics by Gupta, Kumar, 44th Edn, 2017, Pragati Prakashan, Meerut.
3. Introduction to Electronics by K J M Rao Oxford and IBH Publishing Company.
4. Basic Electronics Solid State by B. L. Theraja, Multicolour Edn- 2008, S. Chand & Company New Delhi.
5. Principles of Electronics by V. K. Mehata, Rohit Mehata, 2013 Edn, S. Chand & Company New Delhi.

CCE-IVB (Paper-IX): Introduction to Microcontroller Intel 8051

Credits : 02 **Periods : 45** **Max Marks: 50**

Course Pre-requisite: P-VII: Microprocessor & Its Applications

Course Objectives:

1. To introduce concept of Microcontroller & study of Intel 8051 .
2. To study internal organisation of 8051.
3. To study instruction set of 8051 and ALP.

Course Outcome:

1. Knowledge of internal architecture of 8051 and function of each block.
2. Instruction set of 8051 and ALP skills.
3. Knowledge of SFRs, Timers and Interrupts of 8051.

Unit I: Microcontroller Intel 8051 (12 periods)

Block diagram of microcontroller, comparison between microprocessor and microcontroller, pin diagram, features of 8051, functional pin diagram, pin description, architectural block diagram of 8051, function of each block, structure of internal RAM.

Unit II: Instruction Set of Microcontroller Intel 8051 (13 periods)

Classification of instructions, syntax of instructions, addressing modes, function and execution of every instruction. (Note: Standard symbols and syntax for all instructions must be followed from Book No. 1)

Unit III: 8051 Assembly Language Programming (10 periods)

Programmes for addition, subtraction, multiplication, division, OR, AND, XOR operations, 1's complement, 2's complement, sum of series, binary to gray conversion, gray to binary conversion, larger of two numbers, smaller of two numbers and transfer of data block.

Unit IV: SFRs, Timers and Interrupts of 8051 (10 periods)

Special function registers (list, structure and uses), timers, programming of timers/counters in various modes, interrupts, priority structure of interrupts.

Reference Books:

1. 8051 Microcontrollers: Hardware, Software and Applications by Udayshankara and M. S. Mallikarjun Swamy, McGraw Hill Publication.
2. Microprocessors and Microcontrollers by U. S. Shah, Revised 2nd Edn, Tech-Max Publication, Pune.
3. The 8051Microcontroller and Embedded Systems Using Assembly and C by M. A. Mazidi, J. C. Mazidi and R. D. McKinlay, 2nd Edn, Pearson Publications.
4. The 8051 Microcontroller by Kenneth Ayala, 3rd Edn, Cengage Learning India Private Ltd.

CCEP-II (Paper-X): Practicals based on P-VI and P-VIII

Credits : 02 **Periods : 45** **Max Marks: 50**

Note:

1. Every student must perform at least TEN experiments (at least FIVE from each group)
2. Use graphs wherever necessary.

List of Experiments :

Group I :

1. Design voltage divider bias circuit for CE amplifier with centred-Q. Measure it gain at 2 KHz frequency signal.
2. Design single stage C-E amplifier with gain A = 20. Study its frequency response.
3. Design and study Emitter follower (CC amplifier) circuit and determine its output impedance.
4. Design and study inverting amplifier using Op-Amp.
5. Design and study non-inverting amplifier using Op-Amp.
6. Study frequency response of Op-Amp inverting/non-inverting amplifier.
7. Study OP-Amp as an Adder.
8. Study OP-Amp as an Integrator.
9. Study OP-Amp as Schmitt's Trigger
10. Study OP-Amp as Subtractor.

Group II :

1. Construct and study transistorised Hartley oscillator.
2. Construct and study transistorised Colpitt's oscillator.
3. Construct and study transistorised Phase shift oscillator.
4. Construct and test Wein bridge oscillator using Op-Amp.
5. Design and build transistorised astable mutivibrator of given pulse width and space width.
6. Design and study transistorised monostable mutivibrator of given gate width.
7. Construct and study transistorised bistable mutivibrator. Use manual triggering to test.
8. Design and build transistorised monostable mutivibrator using IC 555. Measure its gate width.
9. Construct and study UJT time base circuit.
10. Construct and study constant current ramp generator. Measure its rise time and fall time.

CCEP-III (Paper-XI): Practicals based on P-VII and P-IX

Credits : 02 **Periods : 45** **Max Marks: 50**

Note:

1. Write ALPs and execute the programmes on 8085/8051 trainer kits for the following programms.
2. Draw flowcharts wherever necessary.
3. Every student must perform at least TEN experiments (at least FIVE from each group)

List of Experiments :

Group I : For Microprocessor Intel 8085

1. ALP for addition of two bytes, result 8-bit.
2. ALP for addition of two bytes, result 16-bit.
3. ALP for subtraction of two bytes.
4. ALP to find 2's complement of 8-bit and 16-bit numbers
5. ALP for masking off:
    a) Four LSBs of given 8-bit number.
    b) Four MSBs of given 8-bit number.
6. ALP to transfer a block of data.
7. ALP to find sum of a series of 8-bit numbers.
8. ALP to find smallest/largest number of a given series.
9. ALP to generate square wave using IC 8255.

Group II : For Microcontroller Intel 8051

1. ALP to add two 8-bit numbers.
2. ALP to add two 16-bit numbers.
3. ALP to subtract two 8-bit numbers.
4. ALP to multiply two 8-bit numbers.
5. ALP to divide two 8-bit numbers.
6. ALP to find 2's complement of an 8-bit number.
7. ALP to find 1's complement of a 16-bit number.
8. ALP to logically AND/OR/XOR two 8-bit numbers.
9. ALP to convert an 8-bit Binary number to Gray.
10. ALP to convert an 8-bit Gray number to Binary.
11. ALP to determine sum of a series of 8-bit numbers.
12. ALP to move a block of data.

SEC-I (A): Electronics Lab Skills

Credits : 02 **Periods : 45** **Max Marks: 50**

C.A. (Internal): 25 marks

ESE Skill Exam: 25 marks

Unit-I: Study of Basic Components (**10 periods)**

Study of resistor, capacitor, inductor, thermistor and LDR.

Unit-II: Meters & Instruments (**15 periods)**

Analog multimeter: Front panel, functions, various ranges, sensitivity and handling precautions.

Signal Generators: Front panel controls, functions, features, output impedance and handling precautions.

CRO: Front panel controls, functions, features, maximum frequency limit, minimum and maximum voltage measurements and handling precautions.

Digital LCR meter: Front panel controls, functions, features or ranges and handling precautions.

Hands on Exercises: (20 periods)

1. Use of multimeter to measure resistance, ac/dc voltages and dc currents.
2. Use of multimeter to test semiconductor diode, LED, transistor, electrolytic capacitor, and 7-segment LED display unit.
3. Conversion of given galvanometer into an ammeter of given range.
4. Conversion of given galvanometer into voltmeter of given range.
5. Design series type Ohmmeter using given galvanometer.
6. Use of CRO to compare frequencies of two signal using Lissajous figures.
7. Use of digital LCR meter to measure R, L & C.

Reference Books:

1. Basic Electronics Solid State, Multicolour Edn,, B. L. Theraja, S. Chand & Company, New Delhi.
2. Principles of Electronics, V. K. Mehta, Rohit Mehta, 2012 Edn, S. Chand & Company, New Delhi.
3. Text Book in Electrical Technology, B. L. Theraja, S. Chand & Company, New Delhi.
4. Grob's Basic Electronics, Mitchel E. Schultz, 10 th Edn, Tata McGraw-Hill Pub. Comp. Ltd., New Delhi.

SEC-I (B): Renewable Energy & Energy Harvesting

Credits : 02 **Periods : 45** **Max Marks: 50**

C.A. (Internal): 25 marks

ESE Skill Exam: 25 marks

UNIT-I: Solar Energy (15 periods)

Solar Energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

UNIT-II: Piezoelectric Energy harvesting (15 periods)

Introduction, physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modelling piezoelectric generators, piezoelectric energy harvesting applications, Human power.

Hands on Exercises: **(15 periods)**

Demonstrations and Experiments

1. Demonstration of Training modules on Solar Energy.
2. Conversion of vibration to voltage using piezoelectric materials.
3. Conversion of thermal energy into voltage using thermoelectric modules.
4. Study of power output and efficiency of solar panel.
5. Study of characteristics of solar cooker.

Note: Teacher may conduct any other experiment related to topic.

Reference Books:

1. Non-conventional energy sources, B.H. Khan, McGraw Hill.
2. Solar energy, Suhas P Sukhative, Tata McGraw – Hill Publishing Company Ltd.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 3rd Edn., 2012, Oxford University Press.
4. Renewable Energy sources and Emerging Technologies, Kothari et. Al, 2nd Edition, PHI Learning.
5. Solar Energy : Resource Assesment Handbook, P Jayakumar, 2009.
6. J. Balfour, M. Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA)
7. http://en.wikipedia.org/wiki/renewable_energy.

SEC-II (A): Interfacing Chips

Credits : 02 **Periods : 45** **Max Marks: 50**

C.A. (Internal): 25 marks

ESE Skill Exam: 25 marks

Unit-I: Decoder, Buffer and Latch (12 periods)

Pin out diagram, function table for chip 74LS138, its general applications, generation of control signals MEMR, MEMW, IOR and IOW using 74LS138. Pin out diagram of chip 74LS244, features, interfacing of keys and LEDs using 74LS244. Pin out diagram of chip 74LS373, features and uses.

Unit-II: Peripheral Chips (13 periods)

Functional pin diagram, features, internal block diagram of IC 8253, control register and operating modes of 8253, functional pin diagram, features, internal block diagram of IC 8259, functions of internal registers.

Hands on Exercises: (20 periods)

1. Build and study the circuit to demonstrate generation of MEMR, MEMW, IOR and IOW control signals using IC 74LS138.
2. Build the logic circuit to interface 7-segment LED display to 8085 using 8255.
3. Use of IC 74LS244 to interface 8 LEDs to 8085 using one port of 8255.
4. Draw schematic diagram to select an input buffer with a given address (say F8H).
5. Draw the schematic diagram to generate square wave at port B of 8255. Write the required ALP for this job and execute it.
6. Write an ALP to generate the time delay of specific time using IC 8253. Use one counter and suitable mode. Use external clock if required. Interface LED to check the event.

Reference Books:

1. 8-bit Microprocessor by V. J. Vibhute, P. B. Borole, U. S. Shah, 6th Revised ed., Tech-Max Publications.
2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh Gaonkar, 5th Edn, Penram International Publishing (India) Pvt. Ltd.

SEC-II (B): Electrical Circuit Skills

Credits : 02 **Periods : 45** **Max Marks: 50**

C.A. (Internal): 25 marks

ESE Skill Exam: 25 marks

Unit-I: Simple Circuits (**10 periods)**

Series parallel combinations of resistors, of capacitors, of inductors, series and parallel combination of electrical sources (cells or batteries), troubleshooting in series circuits, troubleshooting in parallel circuits, delta-star and star-delta transformations.

Unit-II: AC Circuits **(15 periods)**

Frequency response of R-C circuit, RC low pass filter, RC high filter, cut-off frequency, Frequency response of L-R circuit, RL low pass filter, RL high filter, cut-off frequency, LCR bandpass filter, its bandwidth, LCR band reject filter, its bandwidth.

Hands on Exercises: **(20 periods)**

1. Verification of series and parallel combination formulae for R / C / L.
2. Verification of delta-star, star-delta transformations for resistors.
3. Study the effect of open and short in series circuit.
4. Study the effect of open and short in parallel circuit.
5. Study frequency response of RC low pass filter.
6. Study frequency response of RC high pass filter.
7. Study frequency response of LR low pass filter.
8. Study frequency response of LR high pass filter.
9. Frequency response of band pass filter.
10. Frequency response of band stop filter.

Reference Books:

1. Basic Electronics Solid State, Multicolour Edn,, B. L. Theraja, S. Chand & Company, New Delhi.
2. Grob's Basic Electronics, Mitchel E. Schultz, 10 th Edn, Tata McGraw-Hill Pub. Comp. Ltd., New Delhi.
3. Hand Book of Electronics by Gupta, Kumar, Part-I, 44th Edn, 2017, Pragati Prakashan, Meerut.