Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for the T.Y.B.Sc. Applied Component

(CBCS)

2020-2021

Program: B.Sc. PHYSICS

Program Code: RJSUPHY

DISTRIBUTION OF TOPICS AND CREDITS

T.Y.B.Sc. PHYSICS SEMESTER V

Paper Name: Analog circuits, Instruments and Consumer applications

Course Code	Nomenclature	Credits	Topics
RJSUPHYAC505	**Analog circuits, Instruments and Consumer applications**	**2**	1. Transducers, Sensors and Optoelectronics Devices 2. Signal Conditioning, SMPS and Measuring Instruments 3. Consumer Appliances 4. Basic programming using C++.
RJSUPHYAC5P01	**Practicals**	**2**	

Course outcome and Learning Outcome

T Y B Sc	SEMESTER V
Analog circuits, Instruments and Consumer applications **Paper Code:** **RJSUPHYAC505**	**Course outcomes:** 1. Explain basic concepts and definitions in transducers. 2. Describe the optical instruments configurations and their applications. 3: Elaborate discussion about the importance of cathode ray oscilloscopes and digital multimeter in Measurement.

	4. Understand the principle of Physics in the working of Microwave oven and construction of printed circuit boards. 5. Develop the understanding of working principles of medical instruments like ECG, EMG, EEG, MRI, CT scan, Ultrasound Sonography etc. 5. Learn the concepts of the programming language of C++ and use it in solving the problems in Physics and mathematics. **Learning Outcomes** On successful completion of this course, students will be able to: 1. Recognize and classify transducers. 2.Identify the various parameters that are measurable in transducers. 3. Practice the construction of opto-electronic systems using opto-electronic devices. 4. Relate the usage of various opto-electronic devices.
Practicals Sem V **RJSUPHYAC5P01**	**Course outcomes:** 1. Students relate the theoretical knowledge by hands on experience. 2. They can take measurements with accuracy and learn to organise apparatus as per circuit diagram. **Learning outcomes:** 1. Employ appropriate instruments to measure given sets of parameters. 2. Design circuits as per need and determine the physical parameters. 3. Write simple C++ language programmes and run on an open source editing platform.

SEMESTER V		L	CR
Analog circuits, Instruments and Consumer applications	Paper Code : RJSUPHYAC505		2
Unit I:Transducers, Sensors and Optoelectronics Devices		15	
1. Transducers: Definition, Classification, Selection of transducers. 2. Electrical transducers: Thermistor, Thermocouple, Pressure Transducer: Strain gauges (wire, foil & semiconductor), Displacement transducer. LVDT, Peizo- Electric Transducer 3. Chemical sensors: pH sensor, Gas sensor (Fundamental aspects), Humidity sensor (Resistive). 4. Optoelectronic Devices: LDR, LED (Construction, Working & Applications), multicolor LED, Seven Segment Display, Liquid Crystal Display (LCD), Photodiode (construction, Characteristics & applications), LDR, Introduction to phototransistor.			
Unit II:Signal Conditioning, SMPS and Measuring Instruments		15	
1. Half wave precision rectifier, Active Peak detector, Active Positive Clamper 2. Active Positive and Negative Clippers 3. Switching Regulators: Basic and Monolithic Switching regulators (buck, boost and buck – boost) (Only basic Configurations) 4. Cathode Ray Oscilloscope: Single trace CRO (Block diagram), Front Panel Controls (Intensity, Focus, Astigmatism, X & Y position, Level knob, Time base (Time/Division) and attenuation (Volts/Division) knobs, X-Y mode), Dual Trace			

CRO (Block Diagram), Probes: 1:1&10:1, Digital Storage Oscilloscope . **5. DMM: 3 ½ Digit, resolution and sensitivity, general specification.**		
Unit III: Modern Techniques and Appliances	**15**	
1. Printed Circuit Board: Introduction, Advantages, classification, Principle of Photolithography (For PCB). **2. Microwave Oven: Operating principle, block diagram (For Explanation), features.** **3. Medical Instruments: Bio-Potential, Types of Electrodes, ECG, EEG, EMG, CT scan and MRI (Principle, Block Diagram(For Explanation) and features), Ultrasonography : Working principle**		
Unit-IV: Basic programming using C++.	**15**	
1. What is C++?, Applications of C++, A simple C++ program, More C++ Statements, Example with Structure of C++ Program, Basic linux commands, Creating the Source File, Compiling and Linking using gcc compiler. **2. Expressions in C++: Introduction, Tokens, Keywords, Identifiers and Constants, Basic Data Types, Declaration of Variables, Reference Variables, Operators in C++, Expressions and Their Types, Special Assignment Expressions, Implicit Conversions, Operator Precedence.**		

3. Control Structures and Functions: for loop, if block and do while, The main function, Function Prototyping, Math Library Functions.		
PRACTICALS (Semester V) Course Code: RJSUPHYAC5P01		**2**
1. A minimum of 02 experiments from each group are to be performed and reported in the journal. **2. The certified journal must contain a minimum of 8 regular experiments.** **3. Use of Bread Boards is preferred wherever necessary.** **4. Enough number of practical sessions including repetition turns will be conducted by the respective department in the practical laboratory.**		
GROUP - A **1. Thermistor Characteristics –Thermal and electrical (H & C)** **2. Thermistor as sensor in temperature to voltage converter using OPAMP** **3. Study of LVDT characteristics** **4. Study of Load Cell / Strain Gauge** **5. Study of seven segment display** **6. Characteristics of Photo diode and photo transistors** **7. Temperature to frequency Conversion using 555 timer.** **GROUP - B** **1. Half wave precision rectifier using precision op-amps (OPA177).** **2. Positive and Negative Clippers using op-amp.** **3. Positive and Negative Clampers using single power supply op-amp (124/324).** **4. Second Order active Low Pass filter (frequency response & phase relation)**		

5. Second Order active High Pass filter (frequency response & phase relation) **6. Active Notch Filter (frequency response & phase relation)** **7. Square and Triangular wave generator using OPAMPs with the concept of duty cycle.** **GROUP - C** **1. Study of variable dual power supply LM 317 & LM 337 (± 3v to ± 15v).** **2. Constant Current source using OPAMP and PNP transistor (o/p current less than 50 mA)** **3. Making PCB for simple circuits (rectifiers, regulators, oscillators, multivibrators, op- amp applications, single stage amplifier etc.), building and testing of the circuits** **4. Visit to Hospital/Diagnostic Centre/Biomedical Research Laboratory and Submission of its report.** **5. (i) Simple microphone amplifier using a transistor.** **(ii) Low voltage audio amplifier using IC LM386** **(iii) Audio power amplifier using IC TBA 810.** **GROUP D** **1. Program using simple formulas.** **2. Program using if-else-if.** **3. Program using loop.** **[Experiment No. 4 may be Hands-on OR Demo experiment which are equivalent to 2 regular experiments and need not to be performed during the Practical Examination Visit to Hospital/Diagnostic Centre/Biomedical Research Laboratory and Submission of its report is equivalent to 2 Regular experiments. Learners will be examined for Expt. 3, 4 and 5 on the basis of submitted report, PPT and viva and need not perform regular experiments during the Practical Examination].**		

References:

1. A Textbook of Applied Electronics – R S Sedha, S Chand & Company, New Delhi.

2. Basic Electronics Solid state - B. L. Thereja, S Chand & Company, New Delhi.

3. Electronic Instrumentation – H S Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.

4. Electronic components and materials: Principles, Manufacture and Maintenance- S. M. Dhir, Tata McGraw-Hill Publishing Company Limited, New Delhi.

5. Measurement and Instrumentation Principles: Alan S. Morris., Butterworth- Heinemann.

6. Transducers and display systems: B. S. Sonde, Tata McGraw-Hill Publishing Company Limited, New Delhi.

7. A course in electrical and electronic Measurements and Instrumentation:

A. K. Sawhney, Dhanpat Rai and Sons.

8. Instrumentation Devices & Systems , 2nd Edition Tata McGrawHill- C.S. Rangan,G.R. Sarma,V.S. Mani

9. Printed Circuits Handbook pdf, Clyde F. Coombs. Jr., McGraw Hill Handbooks, 6th ed.

10. PCB design basics, Mahmoud Wahby, EDN Networks, Nov 2013.

11. Medical Instrumentation Application and Design- J. G. Webster

12. Biomedical instruments and Measurements-L. Crowell, F. J. Weibell, Prentice Hall of India Pvt. Ltd., New Delhi.

13. OPAMPs and linear integrated circuits by R.A. Gayakwad (4th edition, PHI)

14. Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company.

15. http://www.cplusplus.com/doc/tutorial

16. H & C : Modern Electronic Instrumentation & Measurement Techniques By Albert D. Helfrick & William D. Cooper PHI) EEEdition

17. C & D : "OPAMPs and linear integrated circuits" by Coughlin & F. F. Driscoll (6th edition PHI)

Additional references:

1. Digital principles and applications: A.P. Malvino and D. P. Leach. Tata McGraw-Hill.

2. Data Converters– B. S. Sonde, Tata McGraw-Hill Publishing Company Limited, New Delhi.

3. S.P Bali, "Consumer Electronics", Pearson Education Asia Pvt., Ltd., 2008 Edition,

4. EB: Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.

5.S.P Bali, "Consumer Electronics", Pearson Education Asia Pvt., Ltd., 2008 Edition

DISTRIBUTION OF TOPICS AND CREDITS

T.Y.B.Sc. PHYSICS SEMESTER VI

Paper Name: Digital Electronics, Microprocessor programming Scilab, Numerical Analysis by C++

Course Code	Nomenclature	Credits	Topics
RJSUPHYAC605	Digital Electronics, Microprocessor programming and Scilab, Numerical Analysis by C++	**2**	1. Digital Electronics 2. 8085 Microprocessor and Basic Assembly Language Programming 3. Introduction to Scilab 4. Numerical Analysis using C++

RJSUPHYAC6P01	**Practicals**	**2**	

Course outcome and Learning Outcome

T Y B Sc	SEMESTER VI
Digital Electronics, Microprocessor programming andScilab, Numerical Analysis by C++ **Paper Code:** **RJSUPHYAC605**	**Course outcomes:** 1 Explain basic concepts in digital electronics. 2. Understand 8085 microprocessor configurations. 3. Learn programming in Scilab and numerical analysis using C++. **Learning Outcomes:** On successful completion of this course, students will be able to: 1. Learn combinational logic designs and K-map. 2. Understand the concepts of Multiplexers and demultiplexers and use them in combinational logic designs. 3. Learn how to write and execute Assembly language programs. 4. Understand the working of the 8085 microprocessor hardware model.. 5. Learn the open course software Scilab programming and its applications in understanding mathematical concepts like matrices and plotting of graphs.
Practicals Sem VI **RJSUPHYAC6P01**	**Course outcomes:**

	1.The students understand the importance of digital electronics and their use in modern equipment. 2. They learn assembly language programming. 3. They learn scilab programming and advanced C++ programming. **Learning outcomes:** After completing this course the students will be able to 1. Explain working of multiplexer and demultiplexers and their combinational logic designs. 2. Explain the block diagram of the 8085 microprocessor. 3. Write and execute assembly language, C++ and Scilab programmes.

SEMESTER VI		**L**	**CR**
Digital Electronics, Microprocessor programming and Scilab, Numerical Analysis by C++	**Paper Code : RJSUPHYAC605**		**2**
Unit I:Digital Electronics		**15**	
1. Combinational Logic Design: Introduction, Boolean identities, K K-map (2, 3 and 4 variable) **2. Tri-State Devices, Buffers, Decoders, Encoders, D-Latch. Multiplexers, Their use in Combinational Logic design, multiplexer tree, De-multiplexers, Their use in Combinational Logic design, De-multiplexer tree.** **3. Memory Classification.**			
Unit II:8085 Microprocessor and Basic Assembly Language Programming		**15**	

1. Introduction, Historical Perspective, Organization of a Microprocessor Based system, How does the Microprocessor works, Machine Language, Assembly Language, Writing and executing an Assembly Language Program, High Level Languages. 2. 8085 Bus Organization, 8085 Hardware model, 8085 Programming Model, The 8085 Microprocessor, Microprocessor Communication and Bus Timings, De-multiplexing of Address and Data Bus, Generating Control Signals. 3. Instruction, Instruction Word Size, Opcode Format Addressing Modes, The 8085 Instruction Set (Classification) Data transfer Operations, Arithmetic Operations, Logical Operations, Branch Operations, Stack, Introduction to Advanced Instructions and basic programming.		
Unit III: Introduction to Scilab	**15**	
1. Introduction to open source softwares, overview of Scilab, how to get and install Scilab, how to get help, the console, the editor, ducking, using exec, batch processing. 2. Basic elements of the language: variable names, complex numbers, integers, floating point integers, the ans variables, strings. 3. Matrices : Overview, Create a matrix of real values, Accessing the elements of a matrix, low-level operations, element wise operation. 4. Looping and branching: if statement, the select statement, the for statement, the while statement, Break and Continue statement. 5. Functions overview: defining a function, function libraries.		

6. Plotting: Overview, 2D plot, contour plots, titles, axes and legends export.		
Unit IV: Numerical Analysis by C++	**15**	
1. Errors in computation: inherent errors in storing, Numbers due to finite bit representation to use in computer, truncation error, round off errors. **2. Ordering: bubble sort, series Evaluation, Root finding (Bisection method and Newton – Raphson method).** **3. Function Evaluation: sinx, cosx, e^x, numerical differentiation (Newton forward method), numerical integration (trapezoidal rule and Simpson rule), Numerical method for the 1^{st} order differential equation (Euler's method and Runge-Kutta method).** **4. Least square curve fitting, Discussion of algorithm and flowcharts, writing C program for straight line with example in physics.**		
PRACTICALS (Semester VI) Course Code: RJSUPHYAC6P01		**2**
GROUP A **1) Study of 3:8 Decoder (74LS138) and study of 8:3 Priority Encoder (74LS148) and their applications.** **2) Study of Latch (74LS373) and its applications.** **3) Study of 8:1 Multiplexer (74LS151) and its applications.** **4) Study of 1: 4 De-multiplexer (74LS155) and its applications.** **5) Study of ROM and its addressing using decoder.**		

GROUP B

8085 Programming

1) Writing Assembly Language Programs using Direct Register Addressing, Indirect Addressing:-

i) To Add 8-bit/16-bit numbers with CARRY. (Display/Store result and Carry)

ii) To Subtract 8-bit/16-bit numbers with BORROW. (Display/Store result and Borrow)

2) Writing Assembly Language Programs:-

i) To accept 4-bit/8-bits numbers from Keyboard, add/subtract and display/store Result, Carry/Borrow)

ii) To Add a series of numbers. (Display Result and Carry)

iii) To multiply two, 8 - bit numbers (Using Direct Register Addressing, Indirect Addressing) and Display result.

3) Writing Assembly Language Programs:-

i) To transfer a series of blocks of data from Source to Destination.

ii) To find odd/even numbers from a series of blocks of data.

4) Writing Assembly Language Programs:-

i) To find positive/negative nos. from a series of blocks of data. (Display result)

ii) To find maximum/minimum from a series of blocks of data. (Display result) **5) Writing Assembly Language Programs:-** **i) To divide two, 8 - bit nos. (Display Quotient and Remainder)** **ii) To arrange, 8 – bit nos. in ascending/descending order.** **6) Write a program to blink Port C bit n (n = 0 to 7 any one) of the 8255 PPI available on your 8085 kit. Use Bit Set/Reset mode. Find port addresses from manual and use them.** **7) Using 8255 Design a system (both Software and Hardware) that will cause 4 LEDs to flash 10 times when a push button switch is pressed, use suitable delay. (use breadboard to design hardware part)** **GROUP C** **Scilab programming** **1. Solving given differential equations and plotting the results.** **2. Finding eigenvalues and eigenvectors of different matrices.** **GROUP D** **C++ Programming** **1. Program to sum a series.** **2. Program to find Root.** **3. Program to integrate given function**		

References:

1. Digital Electronics and Logic design by N G PALAN.

2. Microprocessor Architecture, Programming and Applications with the 8085. Ramesh Gaonkar, 5th Edition.

3. Modern Digital Electronics 3rd edition (TMH) – R .P. Jain.
4. Microprocessor Architecture, Programming and Applications with the 8085. Ramesh Gaonkar, 5th Edition.
5. Scilab: I. Fundamentals Scilab, from theory to practice, Perrine Mathieu, Philippe Roux 2016
6.Scilab (A Free Software to Matlab) H. Ramchandran, A S Nair 2011
7. Programming in Scilab: Vinu V Das, 2008 New Age International Publishers
8. Scilab A Beginner's Approach by Anil Kumar Varma. 2018 Cengage India Publishers
9. Scilab Manual for Signals and Systems by Mrs Nalini Karchi...-Scilab.in https://scilab.in/lab_migration/generate_lab/31/1
10.Numerical method with computer program in C++, by Ghosh, phindia publications.
11.Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.
12.Computer-oriented numerical methods, by P. Thangaraj, phindia publications

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1. Microprocessor and Applications by Vibhute and Borole, Techmax Publications,

2. Microprocessor, Principles & Applications by Gilmore (2nd Ed) TMH

3. Programming with C++ by D. Ravichandran, Tata McGraw-Hill Publishing Company Limited.

4. "Digital Electronics "by A.P Godse & D.A Godse Technical publications, Pune, Revised third edition, 2008. Pg.No:2.25-2.70 (for Kmaps)