COURSE PLAN

CRITERIA 1.1.1

Serampore Girls College

13, T.C. Goswami Street,
Serampore, Hooghly – 712201, West Bengal
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TEACHING PLAN
DEPT OF COMPUTER SCIENCE

Semester - I				
Course	**Type**	**Course Code**	**Course Name**	**Credit**
Core Course -1	**Theory**	**CMS-A-CC-1-1-TH**	**Digital Logic**	**4**
	Practical	**CMS-A-CC-1-1-P**	**Digital Circuits**	**2**
Core Course -2	**Theory**	**CMS-A-CC-1-2-TH**	**Programming Fundamentals using C**	**4**
	Practical	**CMS-A-CC-1-2-P**	**Programming in C**	**2**

CMS-A-CC-1-1-TH: Digital Logic
Core Course-1: Theory, Credits-04, Contact hours - 60.

Introduction to Computer fundamentals Central Processing Unit (CPU), Primary and Secondary Storage devices, I/O Devices, Classification of Computers: Super, Mainframe, Mini and Personal Computer, System and Application Software.	**02 hours**	**01 class**
Number Systems Weighted and Non - Weighted Codes, Positional, Binary, Octal, Hexadecimal, Binary Coded Decimal (BCD), Gray Codes, Alphanumeric codes, ASCII, EBCDIC, Conversion of bases, 1's, 2's complement representation, Parity bits. **Single bit error detection and correcting codes:** Hamming Code. **Fixed and Floating Point Arithmetic:** Addition, Subtraction, Multiplication and Division.	**05 hours**	**02 CLASS**
Boolean Algebra **Fundamentals of Boolean Expression:** Definition of Switching Algebra, Basic properties of Switching Algebra, Huntington's Postulates, Basic logic gates (AND, OR, NOT), De- Morgan's Theorem, Universal Logic gates (NAND & NOR), Minterm, Maxterm, Minimization of Boolean Functions using K-Map up to four (4) variables, Two level and multilevel implementation using logic gates, simplification of logic expressions.	**08 hours**	**05 CLASS**
Combinational Circuits **Adder & Subtractor:-** Design and Construction of Half adders (2-bit) & Subtractor (2- bit), Full Adder (3-bit) & Subtractor (3-bit) using basic logic gates (OR, AND, NOT) and universal logic gates (NAND & NOR). **Multibit Adder:-** Ripple Carry Adder, Carry Look Ahead (CLA) Adder, BCD Adder, design & construct 1'S & 2'S Complement Adder/Subtractor unit using 4-bit full adderunits, 1-bit, 2-bit, 3-bit and 4-bit magnitude comparator using basic logic gates. **Data Selector-Multiplexer:** Expansion (Cascading), function realization, Universalfunction realization, Multifunction realization. **Encoders:-** Realization of simple Encoders and priority Encoders using Basic and Universal Logic gates. **Data Distributor:-** De-multiplexer, Cascading, realization of various functions.	**20 hours**	**09 CLASS**

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Chip Selector/Minterm Generator - Decoder- Function Realization, BCD Decoders,Seven Segment Display and Decoders. **Parity bit and Code Converters:** Parity bit Generator/Checker, Gray to Binary codeconverter, Binary to Gray Code Converter.		
Sequential Circuits **Latch:** Set/Reset (SR) using NAND and NOR gates, Gated S-R latches, D Latch, J-K Latch, T Flip Flop, race around condition, Master-Slave J-K flip flop, Clock - Duty Cycle, rising time, falling time, negative and positive edge detector circuits, edge triggered SR, D and JK flip flop, flip-flop Conversions, flip-flops with preset/set and clear/resetasynchronous inputs. **Registers:** Serial Input Serial Output (SISO), Serial Input Parallel Output (SIPO), Parallel input Serial Output (PISO), Parallel Input Parallel Output (PIPO), Universal Shift Registers. **Counters:** Asynchronous Counter: UP/DOWN Counters, Mod - N Counters, BCD Counter (Counter Construction using J-K and T Flip Flops). **Synchronous Counter:** UP/DOWN Counters, Mod-N Counters, Ring & Johnson Counters.	**21 hours**	**12 CLASS**
Integrated Circuits (Qualitative study only) **Bipolar Logic Families:** DTL, TTL NOT Gate, TTL NAND Gate, TTL NOR Gate, OpenCollector, Fan-in, Fan-out. **MOS Logic Families:** NMOS, PMOS, CMOS, SSI, MSI, LSI and VLSI classification(concepts only).	**04 hours**	**01 CLASS**

CMS-A-CC-1-1-P: Digital Circuits
Core Course-1: Practical, Credits - 02, Contact hours - 40.

Combinational Circuits

1. Implementation of different functions (SOP, POS) using basic (AND, OR and NOT) logic gates.
2. Study and prove De-Morgan's Theorem.
3. Realization of Universal functions using NAND and NOR gates.
4. Implementation of half (2-bit) and full adder (3-bit) using basic (AND, OR and NOT) and Universal logic gates (NAND & NOR).
5. Implementation of half (2-bit) and Full Subtractor (3-bit) using basic (AND, OR and NOT) and Universal logic gates (NAND & NOR).
6. Design and implement 1-Digit BCD adder using 7483/74283 and other necessary logic gates.
7. Design 4 to 1 multiplexer using basic or Universal logic gates and implement half and full adder/subtractor.
8. Design and implement half and full adder /subtractor and other functions using multiplexers 74151/74153 and other necessary logic gates.
9. Cascading of Multiplexers.
10. Design 2 to 4 decoder using basic or universal logic gates.
11. Study 74138 or 74139 and implement half and full Adder/Subtracto

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12. Implementation of 1-bit magnitude comparator using decoders (74138/74139) and other necessary logic gates.
13. Cascading of Decoders.
14. Study magnitude comparators 7485.
15. Design and construct magnitude comparator (2-bit) using basic (AND, OR & NOT) and universal (NAND/NOR) logic gates.
16. Design a display unit using Common anode or cathode seven segment display and decoders (7446/7447/7448)
17. Design and implement 4-input 3-output (one output as valid input indicator) priority encoder using basic (AND, OR & NOT) logic gates.
18. Study Priority Encoder IC 74147/74148.
19. Design a parity generator and checker using basic logic gates

Sequential Circuits

1. Realization of SR, D, JK Clocked/Gated, Level Triggered flip-flop using basic or Universal logic gates.
2. Conversion of flip-flops: D to JK, JK to D, JK to T, SR to JK, SR to D Flip-flop.
3. Design synchronous and asynchronous counters MOD-n (MOD-8, MOD-10) UP/ DOWN and connecting Seven Segment Display along with decoder for display of counting sequence.
4. Construction of ODD/EVEN n-bit Synchronous Counter, where n is maximum 4.
5. n-bit binary arbitrary sequence synchronous counter where n is maximum 4.

Text/Reference Books

1. Digital Circuits, Vol - I & II, D. Ray Chaudhuri, Platinum Publishers.
2. Digital Systems - Principle & Applications, Tocci&Widmer, EEE.
3. Digital Logic & State Machine Design, Comer, Oxford.
4. Digital Principle & Applications, Malvino& Leach, McGraw Hill.
5. Digital Design, Morris Mano, PHI.
6. Digital Integrated Electronics, H.Taub & D.Shilling, McGraw Hill.
7. Digital Circuits and Design, Salivahan, Vikas.

CMS-A-CC-1-2-TH: Programming Fundamentals using C
Core Course-2: Theory: 04 Credits: 60 hours

Introduction: History, Basic Structure, Algorithms, Structured programming constructs.	04 hours	01 CLASS
C Programming elements: Character sets, Keywords, Constants, Variables, Data Types, Operators- Arithmetic, Relational, Logical and Assignment; Increment and Decrement and Conditional, Operator Precedence and Associations; Expressions, type casting. Comments, Functions, Storage Classes, Bit manipulation, Input and output.	08 hours	02 CLASS
C Preprocessor: File inclusion, Macro substitution.	06 hours	02 CLASS
Statements: Assignment, Control statements- if, if else, switch, break, continue, goto,Loops-while, do while, for.	06 hours	04 CLASS

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Functions: Argument passing, return statement, return values and their types, recursion	06 hours	03 CLASS
Arrays: String handling with arrays, String handling functions.	07 hours	03 CLASS
Pointers: Definition and initialization, Pointer arithmetic, Pointers and arrays, Stringfunctions and manipulation, Dynamic storage allocation.	10 hours	04 CLASS
User defined Data types: Enumerated data types, Structures. Structure arrays, Pointers to Functionsand Structures, Unions	07 hours	04 CLASS
File Access: Opening, Closing, I/O operations.	06 hours	03 CLASS

CMS-A-CC-1-2-P: Programming with C
Core Course-2: Practical: 02 Credits: 40 hours

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series,
S=1+1/2+1/3+1/4+……
4. WAP to compute the sum of the first n terms of the following series, S =1-2+3-4+5…….
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

10. WAP to perform following actions on an array entered by the user :
- **i)** Print the even-valued elements
- **ii)** Print the odd-valued elements
- **iii)** Calculate and print the sum and average of the elements of array
- **iv)** Print the maximum and minimum element of array
- **v)** Remove the duplicates from the array
- **vi)** Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.

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TEACHING PLAN
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Semester - II				
Course	**Type**	**Course Code**	**Course Name**	**Credit**
Core Course -3	**Theory**	**CMS-A-CC-2-3-TH**	**Data structure**	**4**
	Practical	**CMS-A-CC-2-3-P**	**Data structure using C**	**2**
Core Course -4	**Theory**	**CMS-A-CC-2-4-TH**	**Basic Electronic Devices and Circuits**	**4**
	Practical	**CMS-A-CC-2-4-P**	**Basic Electronic Devices and Circuits**	**2**

CMS-A-CC-2-3-TH: Data Structure
Core Course-3: Theory, Credits - 04, Contact hours - 60.

Introduction to Data Structure Abstract Data Type.	**01 hour**	**01 CLASS**
Arrays 1D, 2D and Multi-dimensional Arrays, Sparse Matrices. Polynomial representation	**05 hours**	**02 CLASS**
Linked Lists Singly, Circular and Doubly Lists, Polynomial representation.	**09 hours**	**04 CLASS**
Stacks Array and linked representation of stack, Prefix, Infix and Postfix expressions, utility and conversion of these expressions from one to another, evaluation of postfix and prefix expression using stack, applications of stack, limitations of Array representation of stack.	**05 hours**	**03 CLASS**
Queues Array and Linked representation of Queue, Circular Queue, De-queue, Priority Queues.	**05 hours**	**03 CLASS**
Recursion Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation), Tail recursion.	**05 hours**	**03 CLASS**
Trees Introduction to Tree as a data structure: Binary Trees (Recursive and Iterative Traversals), Binary Search Tree (Traversal, Insertion, Deletion and Searching), Threaded Binary Trees (Traversal and advantages).	**15 hours**	**04 CLASS**
Searching and Sorting Linear Search, Binary Search, Comparison of Linear and Binary Search with respect to time complexity, Selection Sort, Bubble sort, Insertion Sort, Merge Sort, Quick sort, Heap sort, Shell Sort, Radix sort, Comparison of Sorting Techniques with respect to time complexity.	**10 hours**	**06 CLASS**
Hashing Introduction to Hashing, Different hashing Techniques, Collision and resolving collision byOpen Addressing, Closed Hashing, Separate Chaining, Choosing a Hash Function.	**05 hours**	**02 CLASS**

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SAMPLE TEACHING PLAN DEPARTMENT OF PHYSICS

Course Name:	Arduino (Project type)	course plan (PHYSICS)			
	SEMESTER IV				
Paper:PHS-A-SEC-B-TH	Credits: 1				
Topic	**Subtopic**	**NUMBER OF CLASSES**	**ALLOTED TIME**	**CLASS /WEEK**	**NAME OF TEACHER**
1. Introduction to Arduino	Brief history of the Arduino; open-source electronics prototyping	**2**	**MARCH TO MAY (15 weeks approx)**	**2**	**Dr. Sandip Majumdar (SM)**
2. Basic ideas	Basic ideas of Arduino, Familiarize the Arduino board, Setting up the arduino board. Installation of IDE in PC/ laptop for Arduino programming(Sketch)	**3**			
3. Arduino Programming:	(a) Program structure: data types, variables and constants, operators, control statements, loops, functions, string. (b) Interfacing: serial communication, digital and analog input/output, getting input from sensors(e.g. temperature sensor, ultrasonic sensor etc)	**10**			
		TOTAL: 15			
	Practical Projects				
PHS-A-SEC-B-PR	**Credit: 1**				
		NUMBER OF CLASSES			
	1. LED Blinking and fading. 2. Measurement of voltages (Below 5 V and above). 3. Interfacing 7 Segment display. 4. Construction of thermometer using LM35 or Others. 5. Construct the experimental set up for studying simple pendulum and hence determine the acceleration's due to gravity. 6. Construct data logger for studying charging and discharging of RC circuit	**15**			
Reference Books	1. Arduino Cookbook, Michael Margolis, O'Reilly Media (2011) 2. Getting Started with Arduino, Massimo Banzi, O'Reilly Media(2009) 3. Arduino as a tool for physics experiments, Giovanni Organtini 2018 J. Phys.: Conf. Ser. 1076 012026 4. https://www.arduino.cc/en/Guide/HomePage 5. Physics Today 66, 11, 8 (2013); https://doi.org/10.1063/PT.3.2160 6. The Physics Teacher 52, 157 (2014); https://doi.org/10.1119/1.4865518				

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SAMPLE TEACHING PLAN DEPARTMENT OF PHYSICS

Course Name:	DIGITAL ELECTRONICS (Theory) DSE B (1)	COURSE PLAN			
	SEMESTER VI				
Paper: PHS-G-DSE-B-TH	Credits: 4				
Topic	**Subtopic**	**NUMBER OF CLASSES**	**ALLOTED TIME**	**CLASS /WEEK**	**NAME OF TEACHER**
1. Integrated Circuits	Principle of Design of monolithic Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (basic idea and definitions only w.r.t. micron/submicron feature length).	**4**	**MARCH TO MAY (15 weeks approx)**	**6**	**Dr. Sandip Majumdar (SM)**
2. Number System	Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. Signed and unsigned number representation of binary system. Binary addition, Representation of negative number. 1's Complement and 2's Complement method of subtraction.	**7**			
3. Digital Circuits	(a) Difference between Analog and Digital Circuits. (b) AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. De Morgan's Theorems. (c) Switching algebra, Simplication of logical expression using switching Algebra. Fundamental Products and sum term (p term and s term). Minterms and Maxterms. Conversion of a Truth Table into an algebraic expression in (1) Sum of Products form and (2) Product of sum term form. Implementation of a truth table by NAND or NOR gate. Simplification of algebraic expression from truth table using Karnaugh Map.	**20**			
4. Data processing circuits	Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders.	**5**			
5. Sequential Circuits:	Introduction to Next state present state table, excitation table and truth table for Sequential circuits. SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race condition in SR and Race-around conditions in JK Flip-Flop. M/S JK Flip-Flop, T type FF.	**12**			
6. Registers and Counters	(a) Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits). (b) Counters (4 bits): Asynchronous counters: ripple counter, Decade Counter. Synchronous Counter, Ring counter.	**12**			
		TOTAL: 60			
	PRACTICAL				
Paper: PHS-G-CC-2-2-P	**Credit: 2**				
		NUMBER OF CLASSES			
PRACTICALS	1. Determination of unknown resistance by Carey Foster method. 2. Measurement of a current flowing through a register using potentiometer. 3. Determination of the horizontal components of earths magnetic field. 4. Conversion of an ammeter to a voltmeter. 5. Conversion of a voltmeter to an Ammeter	**10**			
Reference Books	1. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill 2. Electronic devices & circuits, S. Salivahanan & N.S. Kumar, 2012, Tata Mc-Graw Hill 3. Electronics: Fundamentals and Applications, D. Chattopadhyay, P.C. Rakshit, New Age Publication				

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SAMPLE TEACHING PLAN DEPARTMENT OF PHYSICS

Course Name:	Electricity and Magnetism (Theory)	COURSE PLAN (PHYSICS)			
	SEMESTER II				
Paper: PHS-G-CC-2-2-TH	Credits: 4				
Topic	**Subtopic**	**NUMBER OF CLASSES**	**ALLOTED TIME**	**CLASS /WEEK**	**NAME OF TEACHER**
1. Essential Vector Analysis	(a) Vector Algebra: Addition of vectors and multiplication by a scalar. Scalar and vector products of two vectors. (b) Vector Analysis: Gradient, divergence and Curl. Vector integration, line, surface and volume integrals of vector fields. Gauss'divergence theorem and Stoke's theorem of vectors (Statement only) and their significances.	**5**	**MARCH TO MAY (15 weeks approx)**	**6**	**Dr. Sandip Majumdar (SM)**
2. Electrostatics	(a) Coulombs law, principle of superposition, electrostatic field. Electric field and charge density, surface and volume chargev density, charge density on the surface of a conductor. Force per unit area on the surface. (b) Electric dipole moment, electric potential and field due to an electric dipole, force and Torque on a dipole. Electric Fields inside matter, Electric Polarisation, bound charges, displacement density vector, linear Dielectric medium, electric Succeptibility and Permittivity. (c) Divergence of the Electrostatic field, flux, Gauss's theorem of electrostatics, applications of Gauss theorem to find Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Gauss's theorem in dielectrics. (d) Curl of the Electrostatic Field. Conservative nature of electrostatic field, Introduction to electriostatic potential, Calculation of potential for linear, surface and volume charge distributions, potential for a uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Energy per unit volume in electrostatic field	**25**			
3. Magnetism	(a) Introduction of magnetostatics through Biot-Savart's law. Application of Biot Savart's law to determine the magnetic field of a straight conductor, circular coil, solenoid carrying current. Force between two straight current carrying wires. Lorentz force law. (b) Divergence of the magnetic field, Magnetic vector potential. (c) Curl of the magnetic field. Ampere's circuital law. Determination of the magnetic field of a straight current carrying wire. Potential and field due to a magnetic dipole. Magnetic dipole moment. Force and torque on a magnetic dipole. (d) Magnetic fields inside matter, magnetization, Bound currents. The magnetic intensity H. Linear media. Magnetic susceptibility and Permeability. Brief introduction of dia, para and ferro-magnetic materials.	**15**			
4. Electromagnetic Induction	Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils.	**5**			
5. Electrodynamics	Maxwell's Equations, Equation of continuity of current, Displacement current, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, Poynting vector, decay of charge in conducting medium	**10**			
		TOTAL: 60			
	PRACTICAL				
Paper: PHS-G-CC-2-2-P	**Credit: 2**				
		NUMBER OF CLASSES			
PRACTICALS	1. Determination of unknown resistance by Carey Foster method. 2. Measurement of a current flowing through a register using potentiometer. 3. Determination of the horizontal components of earths magnetic field. 4. Conversion of an ammeter to a voltmeter. 5. Conversion of a voltmeter to an Ammeter	**10**			
REFERENCE BOOKS	1. A Handbook of Degree PHYSICS (Vol II), C. R. Dasgupta, Asok Kumar Das, Book Syndicate Private Limited 2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education 3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House 4. Electricity and Magnetism; R.Murugeshan; S. Chand Publishing				

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SAMPLE TEACHING PLAN DEPARTMENT OF PHYSICS

Course Name:	Waves and Optics (Theory)	COURSE PLAN			
	SEMESTER IV				
Paper: PHS-G-CC-4-4-TH	**Credits: 4**				
Topic	**Subtopic**	**NUMBER OF CLASSES**	**ALLOTED TIME**	**CLASS /WEEK**	**NAME OF TEACHER**
1. Accoustics	(a) Review of SHM, damped & forced vibrations: amplitude and velocity resonance. Fourier's Theorem amd its application for some waveforms e.g., Saw tooth wave, triangular wave, square wave. Intensity and loudness of sound. Intensity levels, Decibels.	**10**	MARCH TO MAY (15 weeks approx)	**6**	**Dr. Sandip Majumdar (SM)**
2. Superposition of vibrations	(a) Superposition of Two Collinear Harmonic oscillations having equal frequencies and different frequencies (Beats). (b) Superposition of Two Perpendicular Harmonic Oscillation for phase difference δ = 0, π 2 , π: Graphical and Analytical Methods, Lissajous Figures with equal and unequal frequency and their uses.	**5**			
3. Vibrations in String	(a) Wave equation in streched string and its solutions. Boundary conditions for plucked and struck strings. Expression of amplitude for both the cases (no derivation), Young's law, Ideal of harmonics. Musical scales and notes.	**8**			
4. Introduction to wave Optics	Definition and Properties of wave front. Huygens Principle, Electromagnetic nature of light.	**2**			
5. Interference	Superposition of two waves with phase difference, distribution of energy, formation of fringes, visibility of fringes.Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stoke's treatment. Interference in Thin Films: parallel and wedgeshaped lms. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer (a) Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength dierence, Refractive index.	**15**			
6. Diffraction	(a) Fraunhofer diffraction Single slit; Double Slit. Multiple slits and Diffraction grating. (b) Fresnel Diraction: Half-period zones. Zone plate.	**10**			
7. Polarization	Transverse nature of light waves. Plane polarized light, production and analysis. Circular and elliptical polarization. Optical activity.	**10**			
		TOTAL: 60			
	Waves and Optics (Practical)				
PHS-G-CC-4-4-P	**Credit: 2**				
		NUMBER OF CLASSES			
	1. Determination of the focal length of a concave lens by auxiliary lens method. 2. Determination of the frequency of a tuning fork with the help of sonometer. 3. Determination of radius of curvature of plano convex lens/wavelength of a monochromatic or quasi monochromatic light using Newtons ring. 4. Measurement of thickness of a paper from a wedge shaped film. 5. Measurement of specific rotation of active solution (e.g., sugar solution) using polarimeter.	**20**			
Reference Books	1. Advanced Acoustics, D. P. Roychowdhury, Chayan Publisher 2. Waves and Oscillations, N. K. Bajaj, Tata McGrow Hill 3. A textbook of Optics; N Subramanyam, B. Lal and M.N.Avadhanulu; S.Chand. Publishing 4. Optics, B. Ghosh, Sreedhar Publications				

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