Rayat Shikshan Sanstha's

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA

(AUTONOMOUS)

Department of Physics

Syllabus for B.Sc. Part – III w.e.f. from June 2023 onwards

Syllabus for B.Sc. III (Physics) Implemented from June 2020

1. Structure of Syllabus:

B.Sc.-III Semester-V

Paper Title	Theory			Practical		
	Paper Code	Lectures Per week	Credits	Paper Code	Lectures per week	Credits
Compulsory Papers				BPP508	10	4
Mathematical Physics	BPT 501	3	2			
Quantum Mechanics	BPT 502	3	2			
Classical Mechanics Relativity and Electrodynamics	BPT 503	3	2			
Paper-X: Elective Papers (Any one)				BPP509 + Project	10	4
Electrical Winding, Analog Circuits and Instrumentation	BPT 504	3	2			
Electrical Winding, Digital Electronics	BPT 505					
Electrical Winding, Modern Physics	BPT 506					
Numerical Skills in Physics	SECCPT507	2	1	SECCPP510	4	1

B.Sc. III Semester VI

Paper Title	Theory			Practical		
	Paper Code	Lectures Per week	Credits	Paper Title	Lectures per week	Credits
Compulsory Papers						
Nuclear and Particle Physics	BPT 601	3	2	**BPP608**	10	4
Solid State Physics	BPT 602	3	2			
Atomic, Molecular and Astrophysics	BPT 603	3	2	**BPP609 + Project**	10	4
Elective Papers (Any one)						
Solar Energy, Wind and Energy Studies	BPT 604	3	2			
Solar Energy and Energy Harvesting	BPT 605					
Solar Energy, Transducers and Sensors	BPT 606					
Entrepreneurship Development	SECCPT 607	2	1	SECCPP610	4	1

Titles of Papers

Sr. No.	Semester-V	Semester-VI
1	BPT501: Mathematical Physics	BPT601: Nuclear and Partical Physics
2	BPT 502: Quantum Mechanics	BPT602 : Solid State Physics
3	BPT503:Classical Mechanics, Relativity and Electromagnetics	BPT603: Atomic, Molecular and Astrophysics
Elective Papers (Any one)		
4	BPT504:Electrical Winding, Analog Circuits and Instrumentation BPT505: Electrical Winding, Digital Electronics BPT506: Electrical Winding, Modern Physics	BPT604:Solar Energy, Wind and Energy Studies BPT605: Solar Energy and Energy Harvesting BPT606:Solar Energy, Transdusers and Sensors
5	SECCPT507 : Numerical Skills in Physics	SECCPT607 :Entrepreneurship Development
6	BPP 508: Practical Paper V	BPP 608: Practical Paper VII
7	BPP 509: Practical Paper VI	BPP 609: Practical Paper VIII
8	SECCPP510: Numerical Skills Practical	SECCPP610: Entrepreneurship Development (Industrial Visit and Project Proposal Writing)

B.Sc. III Semester V

Course - BPT501:- Mathematical Physics

Course Objectives: Students should

1. understand wave method of solving partial differential equations.
2. study applications of partial differential equations.
3. study Cartesian, spherical polar and cylindrical co-ordinate systems.
4. understand Beta and Gamma functions.

Credits (Total Credits 2)	**Semester V** **BPT501** **Mathematical Physics**	No. of hours per unit/credits
Unit I	**Partial Differential Equation**	**(12)**
	Introduction to differential equations, Method of separation of variables for solving second order partial differential equations, Form of two dimensional laplace equation in Cartesian coordinates and its solution, Three dimensional partial differential equation in Cartesian coordinates and its solution.	
Unit II	**Applications of Partial Differential Equations**	**(10)**
	The differential equation of progressive wave and its solution, Equation of Vibrating String, One Dimensional Heat Flow, Two Dimensional Heat Flow.	
Unit III	**Orthogonal Curvilinear Coordinates**	**(14)**
	Introduction to cartesian, plane polar, spherical polar, and cylindrical co-ordinate systems, concept of orthogonal curvilinear co-ordinates, unit tangent vectors, arc length, area and volume elements in orthogonal curvilinear co-ordinate system, gradient, divergence, curl, del and Laplacian in orthogonal curvilinear co-ordinate system, extension of gradient, divergence, curl, del and Laplacian in Cartesian, spherical polar and cylindrical coordinate systems.	
Unit IV	**Some Special Integrals**	**(9)**

	Gamma function, Properties of Gamma function, Beta function, Properties of Beta function, Relation between Beta and Gamma functions, Error function (Probability Integral)	

Course outcomes:

After completion of syllabus, Students are able to:

1.solve partial differential equations.

2. apply the methods of solving partial differential equations.

3. differentiate among cartesian, spherical polar and cylindrical co-ordinate systems.

4. understand Beta and Gamma functions.

Reference Books

1. Schaum's Outline of Advanced Calculus, Robert C. Wrede, Murray R. Spiegel, McGraw-Hill Education Publication,3rd edition,2010
2. A First Course in Differential Equations with Modeling Applications, Dennis G.Zill, Cengage Learning Publication, 10th edition ,2012
3. Partial Differential Equations, N. P. Bali, Laxmi Publications, 2011
4. Mathematical Physics, B. S. Rajput, Pragati Prakashan-Meerut ,2016
5. Mathematical Methods for Physicists, Arfken, Weber, Elsevier Publication, 7th edition,2012
6. Mathematical Methods for Scientists and Engineers, McQuarrie, Viva Books Publication ,2008
7. Essential Mathematical methods, K. F. Riley, M. P. Habson, Cambridge University Press,1st edition,2011
8. Mathematics for Physicists, Susan M. Lea, Brooks Cole Publisher, 2003.
9. Mathematical Physics, B. D. Gupta, Vikas publishing house Pvt. Ltd., 4th edition-2010.
10. Mathematical Physics, H. K. Dass, Rama Varma, S. Chand & Company Pvt. Ltd.,7th Edition2014

B.Sc. III Semester V
Course - BPT501:- Quantum Mechanics

Course Objectives:Students should

1. study the particle aspect of radiation.
2. study Schrödinger wave equations, Eigen values and Eigen functions.
3. study the applications of Schrödinger wave equation.
4. understand operators, Eigen values and Eigen functions of L^2 and Lz, Commutation relation between x and p, the Hilbert space and wave functions.

Credits (Total Credits 2)	**Semester V** **BPT 502** **Quantum Mechanics**	No. of hours per unit/credits
Unit I	**Review of Quantum Mechanics**	**(12)**
	Inadequacy of classical mechanics, origin of quantum theory, photoelectric effect, law of photoelectric emission, Compton effect, Ritz combination, principle of Plank's constant	
Unit II	**Schrodinger's Wave Equation**.	**(10)**
	Wave function and its physical interpretation, Condition of physically acceptable wave function, Normalized and orthogonal wave functions, Schrödinger time dependent and time independent (steady state) wave equations in 1D and 3D, Probability current density (continuity equation), Eigen values and Eigen functions, Expectation values of dynamic variables.	
Unit III	**Applications of Schrodinger's Equation**.	**(11)**
	Particle in a rigid box (infinite potential well) in one dimension and three dimension, Step potential- reflection and transmission coefficients, Potential barrier-tunneling effect (qualitative treatment), Schrodinger equation for Hydrogen atom in spherical polar coordinates, Separation of radial and angular parts, Solution of radial part of	

	Schrodinger's equation - Energy Eigen values.	
Unit IV	**Operators and Mathematical Tools in Quantum Mechanics**	**(12)**
	Definition of an operator, Position operator (x), Linear momentum operator (p), Hamiltonian operator (H), Angular momentum operator (L)–components of angular momentum operator in Cartesian coordinate system, Ladder operators, Eigen values of Lz and L2 (use equations for L2 and Lz in spherical polar coordinates), Commutation relation between x and p, The Hilbert space and wave functions: The linear vector space, The Hilbert space, Dimension and basis of a vector space, Square integrable functions (Wave functions)	

Course outcomes:

Unit I: After completion, Students are able to:

1. understand the photoelectric and Compton effect
2. understand Schrödinger time dependent and time independent wave equations
3. apply Schrodinger equation for the study of microscopic phenomena
4. use operators and commutation relations

Reference Books

1. Quantum Mechanics Concept and Applications-Nouredine Zettili,A John Wiley and Sons Ltd Publisher, 2nd edition, 2009.
2. Quantum Mechanics, Satya Prakash and C. K. Singh, Kedar Nath and Ram Nath Co.Publisher, 2012.
3. Quantum Mechanics,V. Murugan , PEARSON INDIA Publisher, 1st edition ,2014
4. Quantum Mechanics- G.Aruldas , Prentice Hall India Learning Private Limited Publisher, 2nd edition ,2008
5. AText book of Quantum Mechanics, P.M. Mathews and K. Venkatesan, Tata McGraw Hill Publisher,2nd Edn,2010
6. Quantum Mechanics Theory and Applications, A. K. Ghatak and S. Lokanathan, Laxmi Publications Pvt Ltd, 1st edition, 2019.

B.Sc. III Semester V
Course - BPT 503:- Classical Mechanics and Electrodynamics

Course Objectives: Students should

1. understand moving co-ordinate system and pseudo forces.
2. learn langrangian formulation , D'Alembert's principle and applications.
3. study equation of motion with the help of Hamiltonian
4. study concept of motion of charged particles in uniform electric and magnetic fields.

Credits (Total Credits 2)	**Semester V** **BPT 503** **Classical Mechanics and Electrodynamics**	No. of hours per unit/credits
Unit I	**Moving Coordinate System and Coupled Oscillations**	**(12)**
	Moving origin of coordinates, Pseudo force, Rotating coordinate system, Coriolis force, effect of Coriolis force in nature (Flight of missiles and formation of cyclones) Frequencies of coupled oscillatory systems, Normal modes and normal coordinates, Energy of coupled oscillations, Energy transfer in a coupled oscillatory system	
Unit II	**Langrangian Formulation**	**(11)**
	Constraints, degrees of freedom, generalized co-ordinates, principle of virtual work, D'Alembert's principle, Lagrange's equation from D'Alembert's principle, Applications of Langrange's equation: Motion of particle in free space, Atwood's machine and Bead sliding on rotating wire.	
Unit III	**Hamiltonian Formulation**	**(10)**
	Hamilton's principle, deduction of Hamilton's principle from D'Alembert's principle, deduction of Langrange's equation from Hamilton's principle, Applications - Shortest distance between two points in a plane, Brachistochrone problem.	

Unit IV	Charged particle Dynamics	(12)
	Poisson's and Laplace's equation and their physical significance, Laplace equation in one dimension and it's solutions, non-relativistic motion of charged particles- in uniform electric field E, magnetic field B, crossed uniform electric field E and magnetic field B, Relativistic motion of charged particles- in constant electric field E, magnetic field B.	

Course Outcomes :

After completion of the units, Students are able to:

1. understand the moving coordinate system
2. understand the coupled oscillations
3. define constraints, Degree of freedom and generalized coordinates etc., and understand principle of virtual work and D'Alembert's principle.
4. derive Lagrange's equation from D'Alembert's principle and understand its of Langrange's equation.
5. define Poisons and Laplace equation and their physical significance and describe motion of charged particles in electric and magnetic fields.

Reference books

1. Classical mechanics, Goldstein Herbert, Narosa public/Person education,2018
2. Classical Mechanics, N. C. Rana and P. S. Joag, Tata Mcgraw Hill Publishing Co. Ltd , 2001
3. Classical Mechanics, S.L. Gupta, V. Kumar and H.V. Sharma, Pragati Prakashan, Meerut, 2001
4. Classical mechanics, P. V. Panat , Alpha Science International Ltd Publisher,2004
5. Introduction to Classical Mechanics, R.G.Takawale and P.S. Puranik , Tata Mc- Graw Hill Publisher , New Delhi,1980
6. Classical Electrodynamics, Puri S.P.,TATA MC GRAWHILL PUBLISHING COMPANY LIMITED ,1990 Classical Electrodynamics, Jackson J.D., Wiley Publisher; Third edition, 2007.

B.Sc. III Semester V
Course - BPT 503:- Electrical Winding and Digital Electronics

Course Objectives: Students should

1. study construction and working of UJT.
2. Study working of Operational Amplifier and its applications.
3. understand number system.
4. Study derived gates and Timer IC.

Credits (Total Credits 2)	Semester V BPT 504 Electrical Winding and Digital Electronics	No. of hours per unit/credits
Unit I	**Uni Junction Transistor (UJT)**	**(11)**
	Introduction, Construction, intrinsic stand-off ratio, Operation and characteristics of UJT, Applications of UJT - Relaxation oscillator, Sawtooth wave generator.	
Unit II	**Operational Amplifier**	**(12)**
	Differential amplifier and its type, Op-Amp, Block diagram of an Op- Amp. Op-Amp parameters, Characteristics of an ideal and practical Op-Amp (IC 741), Applications of Op-Amps: Inverting amplifier and Non-inverting amplifier,Adder, Substractor, Differentiator, Integrator	
Unit III	**Hamiltonian Formulation**	**(11)**
	Review of number system, Binary to decimal conversion, Decimal to binary conversion, One's Complement Representation, Two's Complement Representation ,BinaryArithmetic, Octal to decimal conversion, Decimal to octal conversion, Octal to Binary conversion, Binary to Octal conversion, Hexadecimal to Decimal conversion, Decimal to hexadecimal conversion, Hexadecimal to Binary conversion, Binary to Hexadecimal conversion.	
Unit IV	**Logic gates and Timer IC-555.**	**(14)**

	Review of basic logic gates, Derived logic gates (NOR, NAND, XOR and XNOR gates), NAND and NOR gates as universal gates, De Morgan's theorems. Block diagram of IC 555, IC 555 Pin configuration, Applications of IC 555 as astable and monostable multivibrator.	

Course Outcomes:

After completion of the units, students are able to

1.explain characteristics of UJT and its applications.

2. describe characteristics of an ideal and practical Op-Amp.

3. distinguish number systems.

4. construct derived gates using basic gates.

Reference Books

1. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, Tata McGraw Hill Publisher ,7th Edition, 2011,
2. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, Oxford University Press. 6th Edition , 2014.
3. Fundamentals of Digital Circuits, A. Anand Kumar, PHI Course Ltd Publisher, 2nd Edition, 2009.
4. OP-AMP and Linear Digital Circuits, R.A. Gayakwad, PHI Course Pvt Publisher, 2000
5. Electronic Principle, Albert Malvino, Tata Mc-Graw Hill Publisher, 2008.
6. Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, Tata Mc-Graw Hill Publisher, 2012

BPT 505: Electrical Winding and Digital Electronics
Theory: 45 Lectures (48 minutes) (36 Hours) Marks-50 (Credits: 02)

Course Objectives: Students should
1. Study single phase and 3-phase supply electrical supply systems.
2. Understand the rewinding procedure of motors.
3. Study working of operational Amplifiers and Timer.
4. Study derived gates.

Credits (Total Credits 2)	**Semester V** **BPT 505: Electrical Winding and Digital Electronics**	**No. of hours per unit/credits**
	A. Electrical Winding	
Unit I	**1.Electrical supply system and Introduction to re-winding:**	**(11)**
	AC single phase and 3-phase supply, Difference between single and three, phase supply in respect of voltage, current and power, Safe handling of stripping/winding tools, BIS rules for winding/rewinding, Types of winding wires, Types of insulating materials, Insulating materials as per class of insulation (A/E/B/C/F/H), Reasons for insulation failure in electrical machines, Method of stripping the old winding, Methods of preparing the winding former and the coils. Preparation of winding data as per old winding and rating plate of machine	
	2. Rewinding procedure of motors	**(11)**
	Procedure followed for re-winding of all kind of electric motors like single phase AC motors, pump motors, ceiling fan motors, table fan motors, submersible pump motor, etc., various methods used of inserting coil into the slots. Preparation of winding table, connection diagram, winding diagram for given Motor, Testing for continuity and insulation	
	B. Digital Electronics	

UNIT II	**3.Operational Amplifier**	**(9)**
	Differential amplifier and its type, Op-Amp, Block diagram of an Op- Amp. Op-Amp parameters, Characteristics of an ideal and practical Op-Amp (IC 741), Applications of OpAmps: Inverting amplifier and Non-inverting amplifier, Adder, Substractor, Differentiator, Integrator.	
	4. Digital Electronics and Timer IC	**(14)**
	Review of number system, Binary number system, Binary Arithmatic, 1's and 2's Compliment Method, Octal number System, Hexadecimal number System. Review of basic logic gates, Derived logic gates (NOR, NAND, XOR and XNOR gates), NAND and NOR gates as universal gates, De Morgan's theorems. Block diagram of IC 555, IC 555 Pin configuration, Applications of IC 555 as astable and monostable multivibrator	

Course Outcomes:

Unit I : After completion of the unit, students are able to explain

1. single phase and 3-phase supply electrical supply system.
2. rewinding procedure of motors.

Unit II: After completion of the unit, students are able to explain

1. working of operational Amplifier and Timer.
2. derived gates.

Reference Books

1. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, Tata McGraw Hill Publisher ,7 th Edition, 2011,
2. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, Oxford University Press. 6 th Edition , 2014.
3. Fundamentals of Digital Circuits, A. Anand Kumar, PHI Course Ltd Publisher, 2 nd Edition, 2009
4. OP-AMP and Linear Digital Circuits, R.A. Gayakwad, PHI Course Pvt Publisher, 2000
5. Electronic Principle, Albert Malvino, Tata Mc-Graw Hill Publisher,2008
6. Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, Tata Mc- Graw Hill Publisher, 2012

BPT 506: Electrical Winding and Modern Physics
Theory: 45 Lectures (48 minutes) (36 Hours) Marks -50 (Credits: 02)

Course Objectives: Students should

1. Understand single phase and 3-phase supply electrical supply system.
2. Study rewinding procedure of motors.
3. Study concept of optical fiber.
4. Understand number system.

Credits (Total Credits 2)	**Semester V** **BPT 506: Electrical Winding and Modern Physics**	**No. of hours per unit/credits**
	A. Electrical Winding	
Unit I	**Electrical supply system and Introduction to re-winding:**	**(11)**
	AC single phase and 3-phase supply, Difference between single and three, phase supply in respect of voltage, current and power, Safe handling of stripping/winding tools, BIS rules for winding/rewinding, Types of winding wires, Types of insulating materials, Insulating materials as per class of insulation (A/E/B/C/F/H), Reasons for insulation failure in electrical machines, Method of stripping the old winding, Methods of preparing the winding former and the coils. Preparation of winding data as per old winding and rating plate of machine	
	2. Rewinding procedure of motors:	**(11)**
	Procedure followed for re-winding of all kind of electric motors like single phase AC motors, pump motors, ceiling fan motors, table fan motors, submersible pump motor, etc., various methods used of inserting coil into the slots. Preparation of winding table, connection diagram, winding diagram for given Motor, Testing for continuity and insulation	
	B. Modern Physics	
UNIT II	**1. Optical Fibers**	**(11)**
	Principle and structure, types of optical fibers, numerical	

	aperture (definition only) and pulse dispersion in step index fiber, fiber optic communication system (qualitative treatment only), advantages of optical fibers.	
	2. Number System:	**(12)**
	Review of number system, Binary to decimal conversion, Decimal to binary conversion, One's Complement Representation, Two's Complement Representation ,Binary Arithmetic, Octal to decimal conversion, Decimal to octal conversion, Octal to Binary conversion, Binary to Octal conversion, Hexadecimal to Decimal conversion, Decimal to hexadecimal conversion, Hexadecimal to Binary conversion, Binary to Hexadecimal conversion.	

Course Outcomes:

Unit I : After completion of the unit, students are able to explain

1. electrical supply system and Introduction to re-winding.
2. rewinding procedure of motors.

Unit II: After completion of the unit, students are able to explain

1. concept of optical fiber.
2. number system.

References:

1. Modern Physics , BVN Rao,Wiley Eastern Limited Publisher, 1993.
2. Concepts of Modern Physics , Arthur Beiser, Shobhit Mahajan, S Rai Chaudhury, McGraw Hill Education Pvt. Ltd. Publisher, 7 th Edition, 2015.
3. Modern Physics , B. L. Theraja, S. Chand and Company, 16th Edition, 2008
4. Modern Digital Electronics , R. P Jain, Tata McGraw Hill Pvt. Ltd, 4 th Edition, 2012

B.Sc. III Semester V
Course - SECCPT507: Numerical Skills in Physics

Course Objectives: Students should

1. understand the basics of algorithms and flowchart.
2. understand python language and operators.

Credits (Total Credits 2)	**Semester V SECCPT507 Numerical Skills in Physics**	**No. of hours per unit/credits**
Unit I	**Algorithms and Flowchart**	**(12)**
	Algorithms: Definition, properties and development. Flowchart: Concept of Flowchart, symbols, guidelines, types. Examples: Cartesian to Spherical Polar coordinate, Roots of Quadratic Equation, sum of two matrices, sum and product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile at an angle the horizontal	
Unit II	**Overview of Programming and Introduction to Python**	**(12)**
	Structure of a Python Program, Elements of Python, Hello world application, Interpreters, modules, and a more interesting program, Variables, Names and Assignment, Types Input and Output Statements. Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator), Conditional and looping statement.	

Course Outcomes: After completion, students are able to

1. define basics of Algorithms and draw flowcharts.
2. execute programs in python.
3. enlist different operators and their functions.

Reference Books:

1. Introducing Python, Bill Lubanovic**,** Shroff/O'Reilly Publisher, 1st edition, 2014
2. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech Press, 2nd edition 2018

B.Sc. III Semester V

BPP 508: Practical Paper V

Course Objectives: Students should understand

1. Understand experimental determination of surface tension by various methods.
2. Understand experimental determination of Yong's modulus (Y) by various methods.
3. Study use of C programming to solve physics experimental calculations.
4.

Credits (Total Credits 2)	BPP 508 Practical Paper V	No. of hours per unit/credits
	1. Resonance pendulum 2. S.T. of soap solution 3. Surface tension of mercury by Fergusson modified method. 4. Surface tension of mercury by ripple method. 5. Y and n using Flat Spiral Spring 6. Y by Koenig's method 7. Y by Cornu's spiral 8. Searle's Viscometer 9. C program to arrange the given set of numbers in ascending/descending order 10. C program to find largest/smallest number from a given set of numbers 11. C program to find area and perimeter of square 12. C program to find area and circumference of circle 13. Scilab Expt. 1 (problem from Quantum Mechanics) 14. Scilab Expt. 2 (problem from Quantum Mechanics)	

Course Outcomes: After completion, students are able to

1. determine surface tension of mercury by various practical methods.
2. determine Yong's modulus (Y) by various practical methods.

3. use a C program to solve physics experimental calculations.
4. determine viscosity of liquid.

B.Sc. III Semester V

BPP 509: Practical Paper VI Course Objectives:

Student should

1. learn building and testing of various oscillators using BJT.
2. study use of C.R.O. to determine A.C. and D. C. voltages.
3. study relaxation oscillators using UJT.
4. Study methods for fault finding and repairing in various electrical motors.
5.

Credits (Total Credits 2)	**BPP 509 Practical Paper VI**	**No. of hours per unit/credits**
	1. Single stage CE amplifier 2. To design a single stage CE amplifier of given gain using voltage divider bias. 3. Op-Amp as inverting amplifier 4. Schmitt Trigger 5. To built and test Colpitts oscillator using BJT. 6. To built and test Phase shift oscillator using BJT. 7. To built and test Hartley oscillator using BJT. 8. To determine A.C. and D.C. sensitivity of the C.R.O. and to measure unknown frequency. 9. Measurement of phase shift of RC network using CRO. 10. Band gap energy of semiconductor using p-n junction diode. 11. Basic gates and Derived gates 12. Verification of D'Morgans Theorems. 13. UJT as Relaxation oscillator. 14. Fault finding and repairing of Pump motors. 15. Fault finding and repairing of ceiling fan motors, table fan motors. 16. Fault finding and repairing of submersible pump motor.	

Course Outcomes:

After completion, students are able to

1. built and test various oscillators using BJT.
2. use C.R.O. to determine A.C. and D. C. voltages.
3. study the use of UJT as relaxation oscillator.
4. find fault and its repairing in various electrical motors.

REFERENCE BOOKS:

1. Advanced Practical Physics for Students, B. L. Worsnop and H. T. Flint, Asia Publication House, 1971
2. Practical Physics, S. L. Gupta and V. Kumar, Pragati Prakashan, 27th Edition, 2010.
3. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, New Central Book Agency, 10th edition ,2011
5. Experimental College Physics,White and Manning, McGRAW-HILL Book Company. 3rd edition,1954
6. B.Sc. Practical Physics , H. Singh and P.S. Hemne, S. Chand Publication, 2014
7. Practical Physics , Arora, S. Chand Publication, 1957

SECCPP510:
Practical in Numerical Skill in Physics
(Any 10 of following List)

Course Objectives: Student should

1. understand algorithm, flowchart, python program.
2. understand use of WAP.
3.

Credits (Total Credits 2)	SECCPP510 Practical in Numerical Skill in Physics	No. of hours per unit/credits
	1. Write an algorithm to find whether a number is even or odd. 2. Draw a flowchart to calculate the sum of the first 10 natural numbers. 3. Write a Python program to Print “Hello” on the screen 4. Write a Python program to display the current date and time. Sample Output : Current date and time 5. Write a program to convert the given temperature	

	from Fahrenheit to Celsius and vice versa depending upon user's choice. 6. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. 7. WAP To find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user. 8. WAP to display the first n terms of Fibonacci series. 9. WAP to find Odd numbers between 1 to n where n is a positive Integer. 10. WAP to Swap Two Numbers using Temporary Variable. 11. WAP to find the largest of three numbers. 12. Write a Python program to find those numbers which are divisible by 7 and multiple of 5, between 1500 and 2700 (both included). 13. Write a Python program to find the median of three values. Go to the editor Expected Output: Input first number : 15	

Course Outcomes :

After completion, students are able to

1. write algorithm, flowchart and python program
2. solve the problems by using WAP.

B.Sc. Part-III Semester-VI

Syllabus Structure:

Paper Title	Theory			Practical		
	Paper Code	Lectures Per week	Credits	Paper Code	Lectures per week	Credits
Compulsory Papers						
Nuclear and Particle Physics	BPT 601	3	2	BPP608	10	4
Solid State Physics	BPT 602	3	2			
Atomic, Molecular and Astrophysics	BPT 603	3	2			
Paper-XVI: Elective Papers (Any One)						
Solar Energy, Wind and Energy Studies	BPT 604	3	2	BPP609 + Project	10	4
Solar Energy and Energy Harvesting	BPT 605					
Solar Energy, Transducers and Sensors	BPT 606					
Entrepreneurship Development	SECCPT 607	2	1	SECCPP 610	4	1

BPT 601: Nuclear and Particle Physics

Theory: 45 Lectures of 48 minutes (36 Hours)
Marks -50 (Credits: 02)

Course Objectives: Student should

1. interpret properties of nucleus and nuclear reactions.
2. classify nuclear models.
3. discuss different detectors and accelerators.
4. differentiate elementary particles.

Credits (Total Credits 2)	Semester VI BPT 601 Nuclear and Particle Physics	No. of hours per unit/credits
Unit I	**1.General properties of nuclei and nuclear reactions**	**(11)**
	Composition of nucleus, Nuclear size, Nuclear radius, Nuclear spin, Nuclear magnetic moment, Electric quadrupole moment, Mass defect, Packing fraction, Magic numbers, Binding energy, Binding energy per nucleon and its variation with mass number, Nucleus as a liquid drop, Liquid drop model of nucleus to obtain semi-empirical mass formula.	
	2.Nuclear Reactions:	**(4)**
	General scheme of nuclear reactions, Q value of reaction and its calculation, Exothermic and endothermic nuclear reactions, threshold energy, deuteron induced reactions, stripping reaction.	
Unit II	**Particle Accelerators:**	**(11)**
	Need of accelerators, Cyclotron- construction, working, theory- expression for energy of cyclotron and its limitations, Principle of phase stable orbits, Synchrocyclotron- construction, working, advantages and disadvantages, Betatron- Principle, construction,	

	working condition, expression of energy gain.	
Unit III	**Nuclear Detectors:**	**(11)**
	Ionization chamber, Geiger Muller counter- construction, working and theory, dead time and recovery time, quenching mechanism, photoelectric effect, construction of photo- multiplier tube (PMT), Scintillation detector-principle, construction and working, Wilson cloud chamber, Semiconductor detector, cerenkov radiations, cerenkov detector.	
UNIT IV	**Particle Physics**	**(8)**
	Elementary particles and their classification into leptons, mesons and baryons, Symmetries and conservation laws: energy and momentum, angular momentum, parity, Baryon number, Lepton number, isospin, strangeness and charm, quark model.	

Course Outcomes: After completion, students are able to

1. interpret properties of nucleus and nuclear reactions.
2. classify nuclear models.
3. discuss different detectors and accelerators.
4. differentiate elementary particles.

References:

1. Nuclear Physics, D. C. Tayal, Himalaya Publishing House, Mumbai, (5th edition) 2011.
2. Atomic Physics,Volume II: Electricity, Magnetism, and Atomic Physics, John Yarwood University Tutorial Press, London, UK, (1st edition) 1958.
3. Introduction to Nuclear Physics, H. A. Enge, Addison Wesley Publishing Co., Boston, USA, (1st edition) 1966.
4. Nuclear Physics, J. B. Rajam, S. Chand Publishing Co., New Delhi, (7th edition) 1966.
5. Nuclear Physics, W.E.Burcham, Longman Group Limited, London, UK, (2nd edition) 1973.

6. Concepts of Nuclear Physics, B.L. Cohen, McGraw Hill Company, USA, (1st edition) 1976.
7. Atomic and Nuclear Physics, N. Subramanayam and Brij Lal, S.Chand Publishing Co.New Delhi, (2nd edition) 2013.
8. Basic Nuclear Physics and Cosmic Rays, B. N. Shrivastav, Pragati Prakashan, Meerut, (1st edition) 2019.

BPT602: Solid State Physics Theory:
45 lectures of 48 min (36 Hours)
Marks-50 (Credits: 02)

Course Objectives: Students should

1. classify types of crystal structures.
2. analyze the X-ray diffraction methods for structural analysis of crystals.
3. understand the band formation concept
4. study the superconductivity and types of superconductors.

Credits (Total Credits 2)	Semester VI BPT 602 Solid State Physics Theory	No. of hours per unit/credits
Unit I	**Crystal Structure**	**(11)**
	Solids : amorphous, polycrystalline and crystalline materials; lattice, basis, unit cell- primitive, non primitive unit cell, symmetry elements of a cube, Bravais lattices in three two dimensions, Miller indices and interplanar spacing, simple crystal structures – SC, BCC, FCC and HCP (coordination number, atoms per unit cell and packing fraction).	
Unit II	**X – Ray Diffraction by Crystals**	**(10)**
	Reciprocal lattice and its properties, Brillouin zone, Diffraction of X-rays by crystals, Ewald construction, Bragg's law in reciprocal lattice, Experimental Methods X-ray diffraction (Laue method, rotating crystal method, powder photograph method), Analysis of crystal by powder crystal method.	
Unit III	**Elementary Band Theory of Solids**	**(13)**

	Origin of energy bands, one electron approximation, Bloch theorem (statement only), Kronig-Penny model, Velocity of electrons according to band theory, Effective mass of an electron, Distinction between metals, semiconductors and insulators, Hall Effect- Hall voltage and Hall Coefficient.	
Unit IV	**Superconductivity**	**(11)**
	Idea of superconductivity, Critical temperature, Critical magnetic field, Meissner effect, Type-I and Type-II superconductors, Introduction of BCS theory, London equation and penetration depth, Isotope effect, Application (magnetic levitation)	

Course Outcomes : After completion, students are able to

1. classify types of solids
2. discuss different methods for structural analysis of crystal
3. explain concept of energy bands in solid
4. explain superconductivity phenomenon and its types

References :

1. Solid state Physics, S. O. Pillai, New Age Internationl, Publishers, (7th Ed.) 2009.
2. Fundamentals of Solid state Physics, Saxena, Gupta, Saxena and Mandal, Pragati Pakashan, Meerut, (28th Ed.) 2016.
3. Solid State Physics, A. J. Dekker, Macmillan Publishers India Ltd., (1st Ed.) 2000.
4. Introduction to Solid state Physics, Charles Kittel, Wiley India Pvt., (8th Ed.) 2004.
5. Elements of X-ray diffraction, B. D. Cullity and S.Stock, Addison-Wesley, Publishers, (2nd Ed.) 1978.
6. Solid state Physics, R. L. Singhal, Kedarnath Ramnath & Co. Meerut, (7th Ed.) 2001.
7. Solid state Physics, C. M. Kachhava, Tata McGraw-Hill Publishers, (1st Ed.) 2002.
8. Solid state Physics, M.A.Wahab, Narosa Publishing House Pvt.Ltd., (3rd Ed.) 2015.

BPT603: Atomic, Molecular Physics and Astrophysics

Theory: 36 Hours (45 Lectures of 48 minutes)
Marks -50 (Credits: 02)

Course Objectives: Student should study

1. atomic structure, atomic models and atomic spectra.
2. fine structure and Zeeman effect.
3. Rotational spectra and Vibrational spectra.
4. Raman Effect and Characteristic properties of Raman lines.
5. Milky Way galaxy and origin of solar system.

Credits (Total Credits 2)	Semester VI BPT 603 Atomic, Molecular Physics and Astrophysics	No. of hours per unit/credits
Unit I	**Atomic Structure**	**(09)**
	Revision of atomic models- Rutherford and Bohr model. Electron orbits,Atomic spectra, Bohr atom, Energy level and spectra, Atomic excitation, Vector atom model- quantum numbers, Pauli's exclusion principle.	
Unit II	**Atomic Spectra**	**(09)**
	Observed hydrogen fine structure, Spectral notations and optical spectral series for doublet structure, Spectrum of sodium and its doublet fine structure, Selection and intensity rules for fine structure doublets, Normal order offine structure doublets, Electronspin-orbit interaction, Normal and anomalous Zeeman effect and their explanation from vector atom model, Lande's g factor (qualitative).	
Unit III	**1. Molecular Spectra**	**(09)**
	Molecular bond, Electron sharing, H^+ molecular ion, The hydrogen molecule, Rotational energy levels, Rotational spectra, Vibrational energy levels, Vibrational	

	spectra, Vibration – rotation spectra, Electronic spectra of diatomic molecules.	
	2. Raman Spectra	**(09)**
	Raman Effect, Classicaland quantum theory of Raman Effect, Characteristic properties of Raman lines, Difference between Raman spectra and infrared spectra.	
UNIT IV	**Structure of Universe**	**(09)**
	Formation and types of Galaxies, Milky Way galaxy, Origin of solar system - Condensation theory; arguments for and against the theory.Hubble law, Big-Bang theory, Steady state theory, Oscillating theory, Cosmological tests.	

Course Outcomes: **After completion, students are able to**

1. discuss atomic structure, atomic models and atomic spectra.
2. understand fine structure and Zeeman effect.
3. analyze Rotational and Vibrational spectra, Raman Effect and identify Characteristic properties of Raman lines.
4. explain Milky Way galaxy, origin of solar system and universe

Reference books

1. Modern Physics, J.B. Rajam, S. Chand Publishers, (1st Ed.) 1966.
2. Introduction to Atomic Spectra, H. E. White, McGraw Hill Publishers, 1934.
3. Concepts of Modern Physics, Arthur Beiser, McGraw-Hill Higher Education Publishers, (6th Ed.) 1994.
4. Elements of Atomic and Molecular and LASER Physics, Gupta, Kumar, Sharma, Pragati Prakashan, Meerut, (1st Ed.) 2016.
5. Astronomy: Fundamentals and Frontiers, Robert Jastrow and M. H.Thompson, Wiley NewYork, (2nd Ed.) 1974.
6. Molecular Spectra and Molecular Structure: Spectra of Diatomic Molecules, G. Herzberg, Krieger Pub. Co., (2nd Ed.) 1989.

7. Fundamentals of molecular spectroscopy, Colin N. Banwell and Elaine M. McCash, McGraw-Hill College Publishers, (4th Ed.), 1994.

BPT 604: Solar Energy, Wind and Energy Studies
Theory: 45 lectures, 48 minutes (36 Hours)
Marks 50 (Credits: 02)

Course Objectives: Students should understand

1. the solar dryer in which the grains are dried simultaneously by the heated air from the solar collector.
2. to prepare foods for drying
3. to operate the Solar Food Dryer during the drying process
4. the renewable energy systems, its components and interactions between the components.
5. knowledge in a special field such as solar energy, storage.

Credits (Total Credits 2)	Semester VI BPT 604 Solar Energy, Wind and Energy Studies	No. of hours per unit/credits
Unit I	**Solar Drying**	**(11)**
	Introduction: Drying fundamentals, Sun Vs Solar Drying, Types of Solar Dryers; Direct mode, indirect mode, mixed mode, Solar Dryers in practice: Direct mode natural convection dryers, Direct mode forced convection dryers, Indirect mode forced convection dryers, In-house Dryer.	
Unit II	**Evaluation of Solar Dryers**	**(11)**
	Drying behavior, Weather Conditions, Storage, Selection ,Cleaning and Pre-treatment, Overall System drying efficiency, Pick up efficiency, Solar collection efficiency, Performance of solar dryer, comparative testing. Technical development, costs and design.	

Unit III	**Energy and Wind Energy**	**(11)**
	Energy, Forms of energy, Man and environment, Energy chains, Classification of energy resources, Energy demands, Age of renewable and alternatives, Wind energy, Wind energy chains, Wind energy quantum, Planning of wind farm, Wind power density, Efficiency factor of wind turbine (P-H graph), Power of wind turbine for a given incoming wind velocity, Types of a wind turbine generator unit, Horizontal axis propeller type wind turbine generator unit.	
UNIT-IV	**Solar Energy**	**(12)**
	Solar energy, Solar energy spectrum (UV, Visible and IR), Utilization of solar energy- thermal route, photovoltaic route, Essential subsystems in solar energy plant, Solar constant, Clarity index, Solar insolation, Solar energy from satellite station through microwave to earth station, Solar photovoltaic systems, Merits and limitations of solar PV systems, Prospects of solar PV systems, Power of a solar cell and solar PV panel.	

Course Outcomes: After completion, students are able to

1. design the solar dryer.
2. testing foods, grains and vegetables after drying
3. perform an initial design of a renewable energy system.
4. identify, discuss, present and communicate issues within the subject area.

Reference Books

1. Solar Energy Conversion and Photo Energy Systems: Thermal Systems and Desalination Plants (2010), R J Fuller
2. Energy Technology (Non-conventional, Renewable and Conventional): (3rd Ed.), 1994,

S. Rao and Dr. Parulekar, Khanna Publishers, Delhi.
3. Non-conventional Energy sources: (6th edition) 1988, G. D. Rai, Khanna Publishers, Delhi.
4. Solar Energy: (4 th Ed.), 2017, S.P. Sukhatme, J.K. Nayak Tata Mc.Graw Hill Ltd, New Delhi.
5. Solar Energy Utilization: (5th edition) 1995, G. D. Rai, Khanna Publishers, Delhi.
6. Solar Drying: 2012 ,W Weiss, J Buchinger - AEE INTEC Publication, A-8200 Gleisdorf, Austria.

BPT 605: Solar Energy and Energy Harvesting
Theory: 45 lectures, 48 minutes (36 Hours)
Marks 50 (Credits: 02)
A : Thermal applications of Solar Energy

Course Objectives: Student should understand

1. the solar dryer and preparation of foods for drying
2. to operate the Solar Food Dryer during the drying process
3. the Piezoelectric energy harvesting applications.
4. electromagnetic energy harvesting.

Credits (Total Credits 2)	**Semester VI BPT 605 Solar Energy and Energy Harvesting**	**No. of hours per unit/credits**
Unit I	**Solar Drying**	**(11)**
	Introduction: Drying fundamentals, Sun Vs Solar Drying , Types of Solar Dryers; Direct mode, indirect mode, mixed mode, Solar Dryers in practice: Direct mode natural convection dryers, Direct mode forced convection dryers, Indirect mode forced convection dryers.	
Unit II	**Performance Evaluation of Solar Dryers**	**(11)**
	Overall System drying efficiency, Pick up efficiency, Solar collection efficiency, Performance of solar dryer, comparative testing. Technical development, costs and	

	design.	
Unit III	**Piezoelectric Energy harvesting**	**(12)**
	Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power.	
UNIT-IV	**Electromagnetic Energy Harvesting**	**(11)**
	Linear generators, recent applications, Carbon captured technologies, cell, batteries, power consumption, Environmental issues and Renewable sources of energy, sustainability.	

Course Outcomes: After completion, students are able to

1. design the solar dryer.
2.test foods after drying.
3. have deep knowledge on piezoelectric energy harvesting.
4. have deep knowledge on electromagnetic Energy Harvesting

References:

1. Non conventional energy sources, G.D. Rai, Khanna Publishers,New Delhi, (6th Ed.) 1988.
2. Solar enrgy, M. P. Agrawal, S Chand and Co. Ltd, (1st Ed.) 1983.
3. Renewable Energy,Power for a suitable future, Golfrey Boyle, Oxford University Press, (3rd Ed.), 2012 .
4. Solar Energy Resource Assessment Handbook. Renewable Energy Corporation Network for the Asia Pacific, Dr. P, Jayakumar, 2009.

BPT 606: Solar Energy, Transducers and Sensors
Theory: 45 lectures, 48 minutes (36 Hours)
Marks 50 (Credits: 02)

Course Objectives: To Understand

1. the solar dryer in which the grains are dried simultaneously by the heated air from the solar collector.
2. to prepare foods for drying
3. to operate the Solar Food Dryer during the drying process
4. to elucidate sensors and signal conditioning circuits.
5. the different types sensors and transducers

Credits (Total Credits 2)	**Semester VI** **BPT 606** **Solar Energy, Transducers and Sensors**	**No. of hours per unit/credits**
Unit I	**Solar Drying**	**(11)**
	Introduction: Drying fundamentals, Sun Vs Solar Drying , Types of Solar Dryers; Direct mode, indirect mode, mixed mode, Solar Dryers in practice: Direct mode natural convection dryers, Direct mode forced convection dryers, Indirect mode forced convection dryers.	
Unit II	**Performance Evaluation of Solar Dryers**	**(11)**
	Overall System drying efficiency, Pick up efficiency, Solar collection efficiency, Performance of solar dryer, comparative testing. Technical development, costs and design.	
Unit III	**Mechanical and Electromechanical Transducers :**	**(11)**
	Introduction of Transducers, classification- Active and Passive transducers, Characteristics, Mechanical and	

	electromechanical Transducers: LVDT, Resistive Potentiometer, strain gauge-inductive Transducer, capacitative Transducer, Ultrasonic Transducer.	
UNIT-IV	**Sensors**	**(12)**
	Types of photosensistors/photodetectors, X-ray and Nuclear radiation sensors, Fibre optic sensors, Smart sensors, Applications of sensors, Introduction-primary sensors, Excitation amplification, Filters, converters-data communication, standards for smart sensor interface, Film sensors, MEMS sensors, Nano sensors, Applications of sensors.	

Course Outcomes: Students are able to

1. design the solar dryer.
2. test foods after drying
3. Ability to analyse, formulate and select suitable sensor for the given industrial applications.
4. Acquire In depth Knowledge on different types of sensors and transducers.

Reference Books

1. Solar Energy Conversion and Photo Energy Systems: Thermal Systems and Desalination Plants (2010), R J Fuller
2. D. Patranabis, Sensors and Transducers, Prentice-Hall of India, (2nd Ed.), 2005.
3. M.J. Usher, Sensors and Transducers, Macmillan, London, 1985.

SECCPT607: Entrepreneurship Development (EDP)
Theory: 24 lectures, 48 minutes (18 Hours)

Course Objectives:

1. Identification of opportunities for development
2. To learn the mechanism of finance and fund raising
3. To understand the importance of marketing for better business opportunities
4. To understand procedure of energy audit.

Credits (Total Credits 2)	**Semester VI BPT 607 Entrepreneurship Development (EDP)**	**No. of hours per unit/credits**
Unit I	**Entrepreneurship Development**	**(06)**
	Introduction to entrepreneurship, Identification of opportunities for entrepreneurship, Concept of different occupations: - business, employment and profession. Functions of an entrepreneur. Business idea and plan, Types of businesses / ownerships – Sole Proprietorship, Partnership, Private limited company, Public limited company, Joint stock Company, Co- operative society.	
Unit II	**Sources of Finance**	**(05)**
	Preparation of project report for business, Sources of finance – government and nongovernment agencies, Working capital, Cash flow, Fund flow, Preparation of basics of financial statements, costing and pricing, Policies and incentives.	
Unit III	**Marketing Management**	**(06)**
	Small business management and entrepreneurship, Woman entrepreneurship, Features of small business	

	firms, Process of management in small business, Concept of data and information, Information as acommodity, Study of marketing strategy and marketing mix, Decision-making models, Types of decisions, Decision Support Systems, Introduction to e-commerce, types – B2B, B2C, C2B, C2C. Case study on Small scale industries in India.	
UNIT-IV	**Energy Audit**	**(07)**
	Need of Energy audit - Types of energy audit - Energy management (audit) approach - understanding energy costs - Bench marking - Energy performance - Matching energy use to requirements - Maximizing system efficiencies - Optimizing the input energy requirements - Duties and responsibilities of energy auditors - Energy audit instruments - Procedures and Techniques.	

Course Objectives: After completion, students are able to

1.understand about Entrepreneurship, Creativity & Opportunities.
2.avail the financial and marketing skill
3.to prepare the proposal for small scale industry.
4.to study the procedure of energy audit.

Reference Books

1. Energy Management, W.R.Murphy, G.Mckay, Butterworth-Heinemann Ltd., 1981.
2. Energy Management Principles, Craig Smith Kelly Parmenter, Elsevier Publishers., 2015.
3. Efficient Use of Energy, I.G.C.Dryden, Elsevier Publishers, (2nd Ed.) 1982.

4. Energy Economics, A.V.Desai, New Age Publishers, 1996.
5. Entrepreneurship, Alpana Trehan, Wiley India Publishers, (1st Ed.) 2011.
6. Complete guide to successful Entrepreneurship, G.N.Pande, S.Chand (G/L) & Company Ltd ., 1994.

BPP 608: Practical Paper VII

Course Objectives: Student should understand

1. experimental determination of wavelength of sodium by various optical methods.
2. absorption spectrum of a liquid $KMnO_4$ solution.
3. practical use of optical fiber.
4.

Credits (Total Credits 2)	BPP 608: Practical Paper VII	No. of hours per unit/credits
	1. Cardinal points by turn table method 2. Measurement of temperature of Na flame 3. Diffraction at a Single Slit 4. Diffraction at cylindrical obstacle 5. Lloyd's single mirror 6. Double refracting prism 7. Diameter of Lycopodium powder 8. Absorption spectrum of a liquid ($KMnO_4$ solution) 9. Study of divergence of LASER beam 10. Determination of Thickness of air film by interference. 11. Measurement of Numerical Aperture 12. Design of fiber optic Transmitter/ Receiver.	

Course Outcomes: After completion, students are able to

1. Determinate wavelength of sodium by various optical methods.
2. understand the absorption spectrum of a liquid $KMnO_4$ solution.
3. know practical use of optical fiber.

BPP 609: Practical Paper VIII

Course Objectives: Student should understand

1. experimental determination of Self and Mutual Inductance by various methods.
2. calibration of wire by various electrical methods.
3. practical use of solar energy.

Credits (Total Credits 2)	BPP 609: Practical Paper VIII	No. of hours per unit/credits
	1. Self Inductance by Owen's Bridge 2. Self Inductance by Rayleigh's Method 3. Measurement of B_H, B_V and theta using Earth Inductor 4. Mutual inductance using Ballistic galvanometer. 5. Resistance of B.G. by half deflection method 6. Calibration of wire by Carey Foster bridge 7. Calibration of wire by Griffith's method 8. Absolute capacity of condenser 9. I-V characteristics of Solar Cell 10. Determination of constants of BG 11. Polar graph using Photo Cell 12. Study of solar collector. 13. Study of solar hot air collector/ solar dryer. 14. Performance evaluation of box type and concentrating type solar cooker.	

Course Outcomes: After completion, students are able to

1. determine Self and Mutual Inductance by various methods.
2. calibrate wire by various electrical methods.
3. use solar energy in practical life.

REFERENCE BOOKS :

1. Advanced Practical Physics for Students, B. L.Worsnop, H. T. Flint, Asia Publ. House., 1971.
2. Practical Physics, S. L. Gupta and V. Kumar, Pragati Prakashan., (27^{th} Ed.), 2010.
3. An Advanced course in Practical Physics, , D. Chattopadhyay and P. C. Rakshit, New Central Book Agency, (10^{th} Ed.), 2011.

4. Experimental College Physics, White and manning, McGraw-Hill Book Comp., (3rd Ed.), 1954.
5. B.Sc. Practical Physics, H. Singh and P.S. Hemne, S. Chand Publication, (4th Ed.), 2011.
6. Practical Physics, C.L. Arora, S. Chand Publication, 2010.

SECCPT610: Project Work

Project Proposal Writing/Preparation of entrepreneurship Proposal and Presentation/ Industrial Visits.

Revised Scheme of Practical Examination for B. Sc. Part-III

1. Practical examination are conducted semester wise.
2. There are two practical groups for each semester.
3. Every candidate should perform one experiment from each Practical Paper.
4. Practical examination are conducted for 1.5 days per batch (No. of Students = 12)
5. The examination are conducted in two sessions per day and each session are of three hours duration.
6. Study tour is compulsory.
7. At least 80% practical's must be completed by the student.
8. **Scheme of marking for practical examination B. Sc.III Semester V/VI :**