1.2.1

List of New Courses Introduced with Course Contents

Colour Codes		
Employability Contents	**Green**	
Entrepreneurship Contents	**Light Blue**	
Skill Development Contents	**Pink**	
Name of the Subjects/Related to all three Components (Employability/ Entrepreneurship/ Skill Development)	**Yellow**	

List of New Course(s) Introduced

Department : *Pure and applied physics*

Programme Name : *B.Sc. physics*

Academic Year : 2019-20

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
07.	PS/PHY/C-301P	Mathematical Physics-II Lab
08.	PS/PHY/C-302P	Thermal Physics Lab
09.	PS/PHY/C-303P	Digital Systems &Applications Lab
10.	PS/PHY/SEC-301L	Physics Workshop Skills
11.	PS/PHY/SEC-401L	Electrical circuit network Skills
12.	PS/PHY/C-401P	Mathematical Physics-III Lab
13.	PS/PHY/C-402P	Elements of Modern Physics Lab
14.	PS/PHY/C-403P	Analog Systems & Applications Lab

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Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2019-20

School : *School of Physical Sciences*

Department : *Pure and Applied Physics*

Date and Time : *July 13, 2018 – 11:30 AM; July 18, 2018 – 5:00 PM*

Venue : *Smart Class Room*

The scheduled meetings of member of Board of Studies (BoS) of Department of Pure and Applied Physics, School of Studies of Physical Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, were held to design and discuss the B. Sc. (Physics) Second year (III and IV Semesters), scheme and syllabi.

The following members were present in the meeting:

1. Prof. P K. Bajpai
2. Dr. H. S. Tewari
3. Prof. S. B. Kondawar (External Member)
4. Dr. M. N. Tripathi
5. Dr. P. Thakur
6. Dr. R. K. Pandey
7. Dr. T. G. Reddy
8. Dr. R. P. Prajapati
9. Dr. A. K. Gupta
10. Dr. M. P. Sharma
11. Dr. P. Das
12. Dr. T. Trivedi
13. Dr. S. P. Patel
14. Prof. R. Dhar (External member)

The committee discussed and approved the scheme and syllabi. The following Skill Enhancement courses were added in the B. Sc. (Physics) Second year (III and IV Semesters):

- Physics Workshop Skills (SEC-1)
- Electrical Circuits and Network Skills (SEC-2)

Signature & Seal of HoD

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Scheme and Syllabus

Semester	Course Opted	Course Code	Name of the course	Credit	Hour /

					week
I	Core-1	PS/PHY/C-101L	**Mathematical Physics-I**	4	4
	Core -1 Practical	PS/PHY/C-101P	**Mathematical Physics-I Lab**	2	4
	Core -2	PS/PHY/C-102L	**Mechanics**	4	4
	Core -2 Practical	PS/PHY/C-P-102P	**Mechanics Lab**	2	4
	Generic Elective -1 (GE- IA)	PS/PHY/GE-101	To be opted from the pool*	4	4
	Generic Elective - Practical	PS/PHY/GE-P-101	GE-101 practical as opted	2	4
	Ability Enhancement Compulsory Course (AECC)	PS/PHY/AE-101/EC	English Communication / MIL (Hindi Communication)	4*	4
	ECA	Open elective(Optional)	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			TOTAL	24	28
II	Core-3	PS/PHY/C-203	**Electricity and Magnetism**	4	4
	Core -3 Practical	PS/PHY/CP-203	**Electricity and Magnetism Lab**	2	4
	Core -4	PS/PHY/C-204	**Waves and Optics**	4	4
	Core -4 Practical	PS/PHY/CP-204	**Waves and Optics Lab**	2	4
	Generic Elective -2 (GE-IB)	PS/PHY/GE-202/CHM	GE-102 (second course of the same subjected as opted in GE-101	4	4
	Generic Elective - Practical	PS/PHY/GE-P-202/CHM		2	4
	Ability Enhancement Compulsory Course (AECC)	PS/PHY/AE-201/ES	Environmental Science	4*	4
	ECA	Optional elective	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			Total	24	28
SUMMER Internship: 15 days		**Optional elective**	**SwayamSwachhta / NSS / Industrial/ others**	**2**	**100**
	Core-5	PS/PHY/C-301L	**Mathematical Physics-II**	4	4

III	Core -5 Practical	PS/PHY/C-301P	**Mathematical Physics-II Lab**	2	4
	Core -6	PS/PHY/C-302L	**Thermal Physics**	4	4
	Core -6 Practical	PS/PHY/C-302P	**Thermal Physics Lab**	2	4
	Core - 7	PS/PHY/C-303L	**Digital Systems and Applications**	4	4
	Core – 7 Practical	PS/PHY/C-303P	**Digital Systems &Applications Lab**	2	4
	Generic Elective -3 (GEII-A)		To be opted from the pool of GE	**4**	4
	Generic Elective - Practical			**2**	4
	Skill Enhancement Course (SEC - 1)		Physics Workshop Skills	**4***	2 (4)
			Total	**28**	34
IV	Core-8		**Mathematical Physics III**	4	4
	Core -8 Practical		**Mathematical Physics-III Lab**	2	4
	Core -9		**Elements of Modern Physics**	4	4
	Core -9 Practical		**Elements of Modern Physics Lab**	2	4
	Core - 10		**Analog Systems and Applications**	4	4
	Core -10 Practical		**Analog Systems & Applications Lab**	2	4
	Generic Elective -4 (GEII-B)		To be opted from the pool of Generic courses	4	4
	Generic Elective - Practical			4	4
	Skill Enhancement Course (SEC - 2)		**Electrical Circuits and Network Skills**	4*	2 (4)
			TOTAL	28	34
V	Core-11		**Quantum Mechanics & Applications**	4	4
	Core -11 Practical		**Quantum Mechanics Lab**	2	4
	Core -12		**Solid State Physics**	4	4
	Core -12 Practical		**Solid State Physics Lab**	2	4
	Discipline Specific Elective (DSE-1)	PS/PHY/DSE-501L	**DSE-1: Experimental Techniques**	4	4
	DSE-1 - Practical	PS/PHY/DSE-501P	**DSE-1 Lab: Experimental Techniques Lab**	2	4
	Discipline Specific Elective (DSE-2)	PS/PHY/DSE-502L	**DSE-2: Nano Materials and Applications**	4	4

	DSE-2 - Practical	PS/PHY/DSE-502P	**DSE-2 Lab: : Nano Materials and Applications Lab**	2	4
			TOTAL	24	32
VI	Core-13		**Electro-magnetic Theory**	4	4
	Core -13 Practical		**Electro-magnetic Theory Lab**	2	4
	Core -14		**Statistical Mechanics**	4	4
	Core -14 Practical		**Statistical Mechanics Lab**	2	4
	Discipline Specific Elective (DSE-3)	PS/PHY/DSE-503L	**DSE-3: Nuclear & Particle Physics**	4	4
	DSE-3 – Practical	PS/PHY/DSE-503P	**DSE-3 Lab: : Nuclear & Particle Physics Lab**	2	4

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MATHEMATICAL PHYSICS-II LAB

60 Lectures

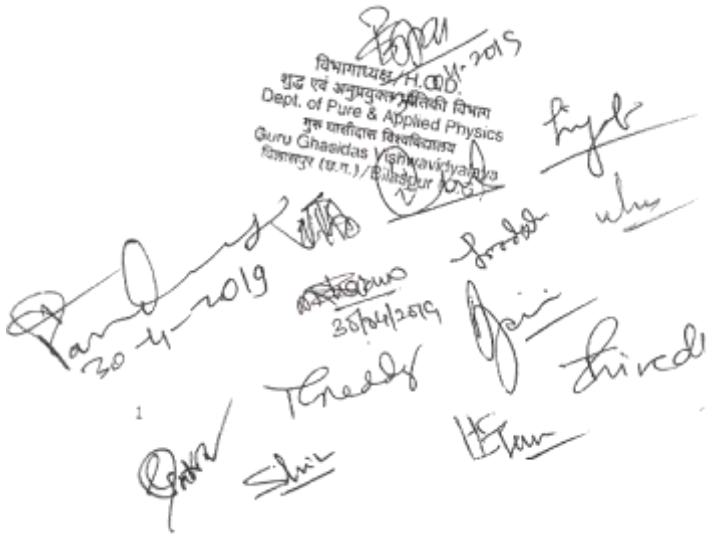
The aim of this Lab is to use the computational methods to solve physical problems. Course will consist of lectures (both theory and practical) in the Lab. Evaluation donenot on the programming but on the basis of formulating the problem

Topics	Description with Applications
Introduction to Numerical computation software Scilab	Introduction to Scilab, Advantages and disadvantages,Scilab environment, Command window, Figurewindow, Edit window, Variables and arrays, Initialisingvariables in Scilab, Multidimensional arrays, Subarray,Special values, Displaying output data, data file, Scalarand array operations, Hierarchy of operations, Built inScilab functions, Introduction to plotting, 2D and 3Dplotting (2), Branching Statements and program design,Relational & logical operators, the while loop, for loop,details of loop operations, break & continue statements,nested loops, logical arrays and vectorization (2) Userdefined functions, Introduction to Scilab functions,Variable passing in Scilab, optional arguments,preserving data between calls to a function, Complexand Character data, string function, Multidimensionalarrays (2) an introduction to Scilab file processing, fileopening and closing, Binary I/o functions, comparingbinary and formatted functions, Numerical methods anddeveloping the skills of writing a program (2).
Curve fitting, Least square fit, Goodness of fit, standard deviation	Ohms law to calculate R, Hooke's law to calculate spring constant
Solution of Linear system of equations by Gauss elimination method and Gauss Seidal method. Diagonalization of matrices, Inverse of a matrix, Eigen vectors, eigen values problems	Solution of mesh equations of electric circuits (3 meshes) Solution of coupled spring mass systems (3 masses)
Solution of ODE First order Differential equation Euler, modified Euler and Runge-Kutta second order methods Second order differential equation Fixed difference method	First order differential equation • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion Second order Differential Equation • Harmonic oscillator (no friction) • Damped Harmonic oscillator • Over damped • Critical damped • Oscillatory • Forced Harmonic oscillator

Using Scicos / xcos	• Generating square wave, sine wave, saw tooth wave • Solution to harmonic oscillator • Study of beat phenomenon • Phase space plots

References:

1. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed.,2006, Cambridge University Press
2. Complex Variables, A.S. Fokas&M.J. Ablowitz, 8th Ed., 2011, Cambridge Univ. Press



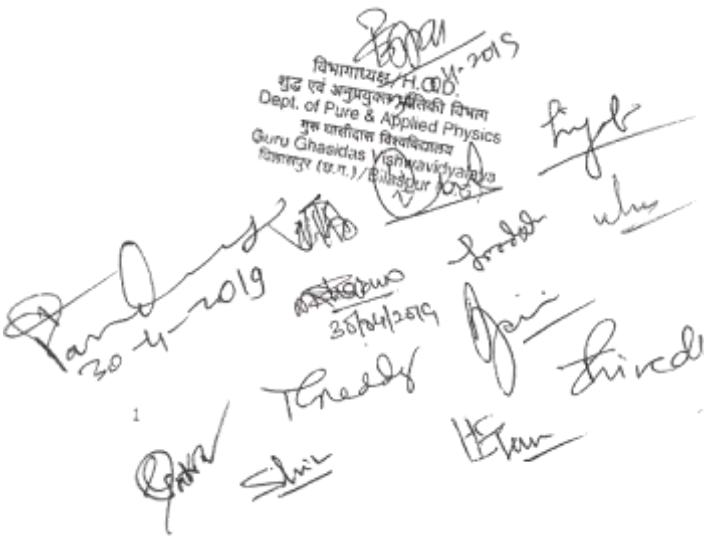
THERMAL PHYSICS LAB

60 Lectures

1. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
2. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's discmethod.
3. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
4. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its TwoJunctions.
5. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2)Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.
6. Coefficient of linear expansion using Gumber method.
7. Specific heat determination by calorimeter method.

References:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985,Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes,D.P.Khandelwal,1985, Vani Pub.



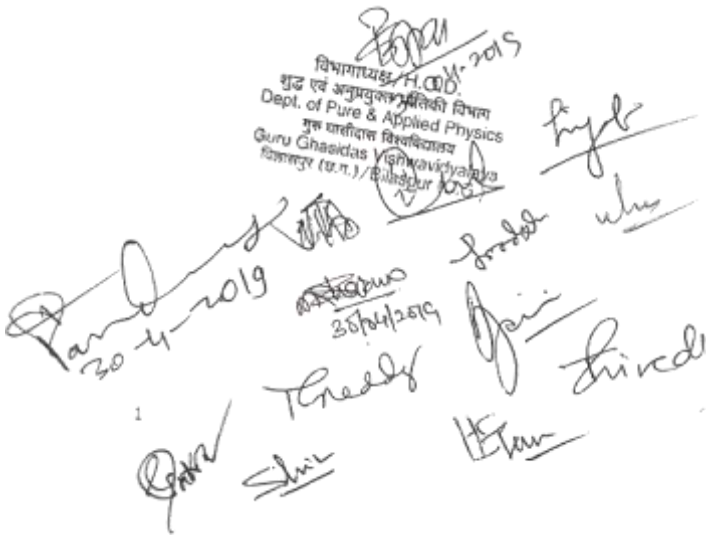
DIGITAL SYSTEMS AND APPLICATIONS LAB

60 Lectures

1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO.
2. To test a Diode and Transistor using a Multimeter.
3. To design a switch (NOT gate) using a transistor.
4. To verify and design AND, OR, NOT and XOR gates using NAND gates.
5. To design a combinational logic system for a specified Truth Table.
6. To convert a Boolean expression into logic circuit and design it using logic gate ICs.
7. Half Adder, Full Adder and 4-bit binary Adder.
8. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder I.C.
9. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
10. To build JK Master-slave flip-flop using Flip-Flop ICs
11. To build a 4-bit Counter using D-type/JK Flip-Flop ICs and study timing diagram.

References:

1. Modern Digital Electronics, R.P. Jain, 4th Edition, 2010, Tata McGraw Hill.
2. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
3. Microprocessor Architecture Programming and applications with 8085, R.S. Goankar, 2002, PrenticeHall.
4. Microprocessor 8085:Architecture, Programming and interfacing, A. Wadhwa, 2010, PHI Learning.



MATHEMATICAL PHYSICS-III LAB

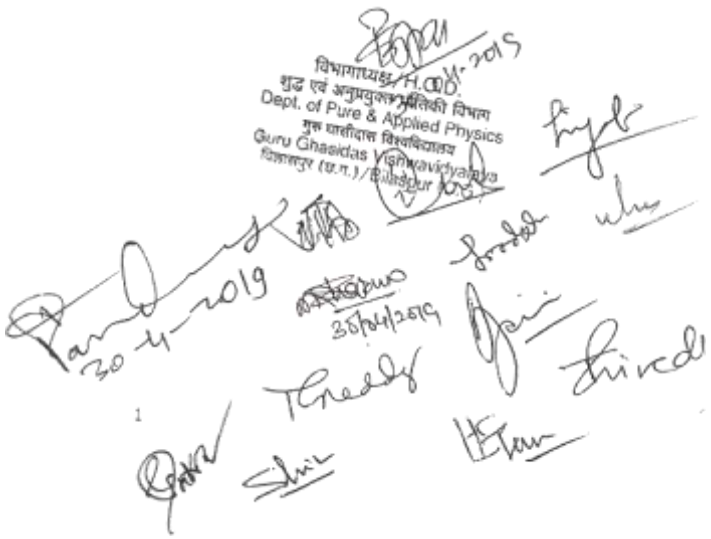
60 Lectures

Scilab based simulations experiments based on Mathematical Physics problems like

1. Solve differential equations: $dy/dx = e^{-x}$ with y = 0 for x = 0$dy/dx + e^{-x}y = x2$ $d^2y/dt^2 + 2\ dy/dt = -yd^2y/dt^2 + e^{-t}dy/dt = -y$
2. Dirac Delta Function: Evaluate complex integrals .
3. Fourier Series: Program to sum (0.2)^n
   Evaluate the Fourier coefficients of a given periodic function (square wave)
4. Frobenius method and Special functions. Plot $Pn(x)$, jv(x) and show recursion relation
5. Calculation of error for each data point of observations recorded in experiments done in previoussemesters (choose any two).
6. Calculation of least square fitting manually without giving weightage to error. Confirmation of least square fitting of data through computer program.
7. Evaluation of trigonometric functions e.g. *sin θ,* Given Bessel's function at N points find its value at anintermediate point. Complex analysis: Integrate 1/(x2+2) numerically and check with computer integration.
8. Integral transform: FFT of $^{(-x2)}$

References:

1. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed.,2006, Cambridge University Press
2. Mathematics for Physicists, P. Dennery and A. Krzywicki, 1967, Dover Publications
3. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and EngineeringApplications: A. VandeWouwer, P. Saucez, C. V. Fernández. 2014 Springer ISBN: 978-3319067896
4. Scilab by example: M. Affouf, 2012. ISBN: 978-1479203444
5. Scilab(A free software to Matlab): H.Ramchandran, A.S.Nair. 2011 S.Chand& Company



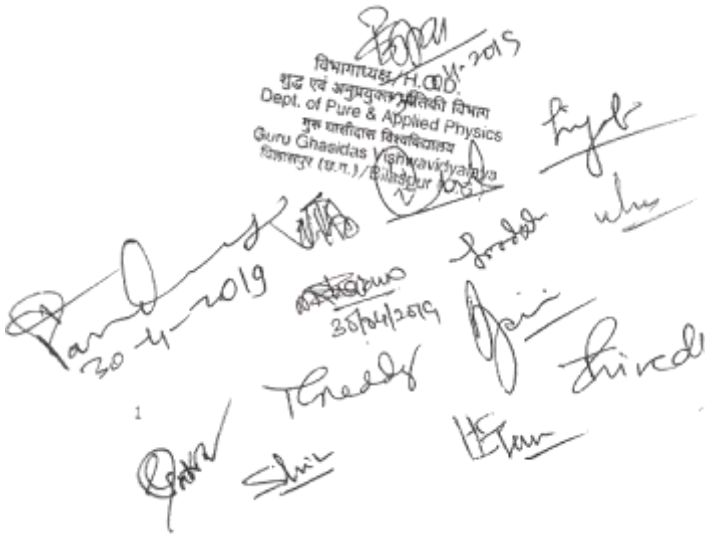
ELEMENTS OF MODERN PHYSICS LAB

60 Lectures

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy ofphoto-electrons versus frequency of light
3. To determine work function of material of filament of directly heated vacuum diode.
4. To determine the Planck's constant using LEDs of at least 4 different colours.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To show the tunneling effect in tunnel diode using I-V characteristics.
8. To determine the wavelength of laser source using diffraction of single slit.
9. To determine the wavelength of laser source using diffraction of double slits.
10. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating

References:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985,Heinemann Educational Publishers
3. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Edn, 2011,Kitab Mahal



ANALOG SYSTEMS AND APPLICATIONS LAB

60 Lectures

1. To study V-I characteristics of PN junction diode, and Light emitting diode.
2. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
3. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To study the various biasing configurations of BJT for normal class A operation.
6. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
7. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
8. To design a Wien bridge oscillator for given frequency using an op-amp.
9. To design a phase shift oscillator of given specifications using BJT.
10. To study the Colpitt`s oscillator.
11. To design a digital to analog converter (DAC) of given specifications.
12. To study the analog to digital convertor (ADC) IC.
13. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
14. To design inverting amplifier using Op-amp (741,351) and study its frequency response
15. To design non-inverting amplifier using Op-amp (741,351) & study its frequency response
16. To study the zero-crossing detector and comparator
17. To add two dc voltages using Op-amp in inverting and non-inverting mode
18. To design a precision Differential amplifier of given I/O specification using Op-amp.
19. To investigate the use of an op-amp as an Integrator.
20. To investigate the use of an op-amp as a Differentiator.
21. To design a circuit to simulate the solution of a 1st/2nd order differential equation.

References:

1. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
3. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.